



TANGANYIKA TERRITORY.

Report
of the
Department of Agriculture
for the year ending
31st March, 1928.

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AGRICULTURAL INSTRUCTION AND EDUCATION.

1. The staff of Native Instructors, whose work and methods of training have been described in former reports, continues to show its usefulness as a means of extension of the activities of District Agricultural Officers, who are naturally keen to maintain and improve the standard of work of these instructors by care in selection and by the closest possible control in order to ensure that the duties of each are carried out satisfactorily. During the year seven apprentice instructors from Songea, Morogoro, Tukuyu and Mbulu were trained at Moshi by the Department.

2. Former reports have also described the position and work of the District Agricultural Officer, who, with the Native Instructors, forms the Department's first line of attack. As regards native agriculture the old method of campaign, the giving of instruction to natives with the aid of demonstration plots owned by those chiefs who could be made sufficiently interested to provide these, and with that of the very localized facilities afforded by Agricultural Stations, possessed its usefulness within its limitations. But the establishment of local native administrations possessing funds for work for their own advancement has brought into view a far brighter prospect for progress and the officers are able now to conduct a far more effective campaign from the strong points afforded by the agricultural sub-stations maintained by the native administrations, functioning as demonstration farms and means for the increase and distribution of the best kinds of well-tested planting material.

3. The vernacular monthly journal, *Mambo Leo*, continues its usefulness in providing an additional means of instruction to native farmers, particularly that of recurring seasonal importance. During the period under report articles dealing with matters of immediate interest to non-native planters and farmers, as well as crop reports, crop estimates, meteorological returns and market reports, have been published by the Department in the English and Indian press at Dar es Salaam. Additional leaflets in the departmental series, on robusta coffee and vegetable-growing, were issued; and the preparation of a leaflet on coconuts and copra, in Swahili, in Roman and Arabic script, was proceeded with. The issue was projected of a series of pamphlets intended for the help of non-native planters.

4. Information regarding agricultural assistance given by the Department to non-natives is presented in the appropriate parts of the succeeding section of the Report.

IMPROVEMENT AND EXTENSION OF CROP PRODUCTION

5. For the more fundamental work in connection with the activities that have just been broadly outlined, the agricultural experiment stations of Morogoro and Mpanganya have been continued; whilst that at Singida, having indicated the lines on which sub-station work in Northern Dodoma should be carried out, was closed. A new agricultural station was opened at Ibadakuli, near Shinyanga, in Northern Tabora; and one is projected in the Lindi Province. When these four agricultural stations are working the four chief broadly differing areas of the Territory will be served by stations for agricultural investigation, namely the hilly coast hinterland (at Morogoro), the riverine coast hinterland (at Mpanganya, Rufiji District), the inland plateau (at Ibadakuli) and the coastlands (in the Lindi Province). The expansion from these is the agricultural sub-stations belonging to the native administrations, serving for demonstration and the multiplication of seed of proved kinds of plants, either native or imported, and for trial of their local suitability. These means for the improvement of agriculture, and others such as the training of natives and oxen in ploughing, are described for each region in the summary which follows. A table showing distribution of planting material is given in Appendix I.

CENTRAL PROVINCE.

6. As has been stated, the Agricultural Station at Singida was closed. On the basis of the preliminary investigation that was conducted there, the work in the four sub-stations opened in the previous year was continued, and three more were started, including one to serve the people of the Iramba Plateau, where conditions are less rigorous through low rainfall than in the country below: the station included a nursery for raising fodder trees, and in another place a nursery for trial of robusta coffee was made. Another sub-station serves the Gogo people of the Rift Valley. At Manyoni, on the Central Railway, the work includes co-operative trials of wheat with non-natives.

7. Singida sub-station promises, with the neighbouring school garden and its nursery with a vegetable garden, to be a useful centre for demonstration and distribution of the seed produced; and it is here that the ploughing school, forecast in the last report, is to be established. The establishment of Native Councils is simplifying the application of the work; but the introduction of better cultivation is slow.

8. As may be expected, in these comparatively dry pastoral areas the chief work is being done with short-season millets, maize and beans and rice, cassava, dry-land fodder plants, the date-palm and wheat. Thirteen native instructors were employed during the year.

NORTHERN PROVINCE.

9. The work was carried out, under the more direct supervision of the Senior Agricultural Officer, North-eastern Circle, by a District Agricultural Officer and two Coffee Officers, with a number of Native Instructors varying from 25 to 14 during the period, most of these being employed in the Moshi and Arusha Districts, with one in the Mbulu District. Two sub-stations were opened, and work was continued in the native co-operative plots. The work at one of the sub-stations, at Usangi, in the northern Pare Mountains at about 4,500 feet, was sufficiently well forward to indicate success with White Congo and Potchefstroom Pearl maize, potatoes, Canadian Wonder beans, soybeans and groundnuts: all of which have been increased for distribution. In Arusha, Ufome and Arusha Chini, the work for natives was chiefly with beans (three kinds), soybeans, maize, rice, potatoes and Pennisetum millet, as well as coffee in the first two areas; the work with coffee in Ufome being entirely experimental, for which 20lb. of robusta coffee seed has been sown at two agricultural sub-stations. The substitution of Faya rice for the inferior kinds in Moshi is making good progress; and the trials of Pennisetum millet in Pare are indicating that it is well suited as a short-rains crop in that area. The general trials of maize in native cultivation are tending to show that Potchefstroom Pearl is best suited to the lower lands and the season of chief rains, and White Congo to the highland areas and short rains. The potato-growing of Arusha was refreshed by the distribution of a ton of seed potatoes from Kenya, and was extended to Pare (Usangi: as has been indicated). The question of the maintenance and improvement of the forage plants on the slopes of Mount Kilimanjaro, of much importance to its cattle-keeping natives, has received attention; and a number of native clovers have been identified, and their value demonstrated, by the District Agricultural Officer (*see* paragraph 13).

10. The degree of intelligence of the greater portion of the native farmers in these areas is such that efforts to introduce and extend the use of agricultural appliances among them meet with greater encouragement than in many other parts of the Territory. Small coffee pulpers have become very popular, and natives are about to acquire small maize hullers and flour-making machines for use with maize and wheat. The forked hoe, introduced by the Department, has become the acknowledged implement among the Chagga people for cultivation, instead of the old, ordinary hoe. The use of measuring rods for planting has already increased output, especially in the food-producing lowlands of Pare.

11. The Kilimanjaro Native Planters' Association, which is virtually a body of native coffee planters, has advanced in capacity to manage its own affairs; so that now it arranges for the marketing of the coffee of its members, under advice, the latter continuing to receive the normal help of the Department through the teaching of cultivation, spraying against pests, and sorting for grading. In the season of 1927 the total quantity of parchment coffee sold by the Association on behalf of its members was 364 tons with a local value of £30,000, the similar figures for that of 1926 having been 95 tons and £7,400; the percentages of first-quality were 96 and 85, respectively, showing that teaching of good coffee-making and sorting was having its effect. The output of Arusha was 36 tons of parchment with 97 per cent. first grade and a total value of £2,340. For the Province the productions of native coffee in the seasons of 1925, 1926 and 1927 were 75, 98 and 400 tons, with local values of £7,450, £9,770 and £32,340, respectively. The first four consignments, sold in London by the end of March, obtained exceptionally good prices: the first sale actually obtaining the highest price for Tanganyika coffee at £139 a ton, a subsequent highest price being as much as £147 a ton. Such progress as that described made without the encouragement of Government, but simply with the teaching and advice of the Agricultural Department for the general protection of the industry, shows that the more intelligent among African tribes, at least, are inherently capable of taking up and developing coffee production successfully and without danger to their own share in the industry or that of others.

12. The non-native coffee industry continues to flourish: the total exports of coffee in the calendar years 1926 and 1927 were 1,468 and 2,305 tons, worth £134,530 and £208,991, respectively. For this industry the Northern Province is fortunate in possessing two Planters' Associations whose members take a lively interest in the means for its improvement and protection; and it is intended to assist them further by posting in the Province a District Agricultural Officer to serve the interests of coffee alone. The recent appointment of a Mycologist and an Assistant Entomologist in the Agricultural Department is of great importance to these planters; and it is hoped that their effective co-operation will be obtained, for the manurial experiments with coffee, already begun. As regards other crops they continued to be assisted during the year by the introduction for co-operative trial of good kinds of wheat, barley and oats, which however gave little success, unfortunately, because of late arrival of the seed or insufficiency of water for irrigation. The assistance to planters toward the establishment of a silk industry was continued, mainly through the Entomologist. The increased importance to non-natives of this Province of crops other than coffee is shown by the circumstance that, of land newly opened in Mondul and Lower Nduruma (Arusha), Ufiome (Mbulu) and Arusha Chini (Moshi), altogether 69,980 acres had been leased by the end of the year, 11,000 of which in Arusha Chini are already in sisal and maize, largely developed by mechanical means.

13. In connection with information wanted for improvement of crop production 999 mounted specimens of plants were sent to Kew by the District Agricultural Officer, Mr. A. E. Haarer, who with the co-operation of the Senior Veterinary Officer, Mr. H. J. Lowe, gave particular attention to grasses, clovers, etc., of seeming use to stock, and to culture, garden and other plants, of probable use in non-native husbandry. The identifications at Kew already number 481, including one new species and material new to that institution.

TANGA PROVINCE.

14. The work in sub-stations, whose beginning was described in the last Report, was continued. The chief progress as regards native production has been made with maize in Usambara; whilst largely owing to discouragement through the prices of 1926, the cotton industry of Pangani and Handeni received a set-back. A District Agricultural Officer was posted in this Province near the end of the year, and this should enable much more to be done

for the agricultural assistance of the Province; to this end eight sub-stations were to be added to the two that existed already. The more intensive inspection of coconut palms in this area, that is now possible, is already beginning to show its effect.

15. The result of the discouragement mentioned was to reduce the output of seed-cotton from 105 and 61 tons in 1926 to 75 and 20 tons in 1927, respectively; but the increased propaganda that is possible with a District Agricultural Officer, and the provision of a ginnery at Langoni, Pangani, are expected to bring cotton production nearer that possible to the capacity of the people, whilst the production of improved food-crops is in the care of the sub-stations. In a wetter area of the Tanga District, round Muheza on the Tanga Railway, there exists already an important native fruit industry, chiefly citrus, as is shown by the circumstance that during 1927, particularly in the months January and June to December, 531 tons of fruit were sent away by railway from Muheza, and large quantities also went to Tanga by road. At Muheza a sub-station for assisting with fruit production, the growing of oil palms and the improvement of food-crops has been opened, supported at present by funds of the Department; and it is in mind to increase the work to that of an agricultural station to provide planting material of good citrus for the whole country, thus making supplies more quickly and certainly available and avoiding the danger always connected with importation from other countries.

16. In Usambara the shortage of staff led to concentration of the teaching of the proper spacing of crops and the growing of more and better maize, mainly by means of instructors. The acceptance by growers of the teaching, and the season experienced, were so favourable that, whereas one sisal firm alone imported 300 tons of maize for feeding labour in 1925, in the season under review the production of maize by natives was sufficient to assist in the feeding of all labourers, thus replacing importation of maize from Kenya, and supply an export of 8,488 bags from Tanga. In the uplands of Usambara natives are showing an increased interest in coffee-growing.

17. In non-native agriculture, the improvement of sisal cultivation is beginning to have its effect; the Department has assisted with co-operative trials of a travelling dry decorticator, the results of which are available for enquirers. The altitude at which coffee is usually planted on estates in Usambara is unfavourable, so that good crops are followed by two years of much-lowered production; diseases and pests are however being kept in check. On two estates, tea-planting has been begun as a new industry for Usambara. Other non-native activities are the considerable planting of kapok, palm oil extraction (Amboni Estates at Magroto); and a small extent of cotton-growing, usually between sisal, varying with the level of the prices of the previous season. Interest also exists in the production of stone fruits, which appears to be worthy of encouragement.

18. The Senior Agricultural Officer, in charge of the circle comprising the Northern and Tanga Provinces, continued the general regional survey of the latter Province by tours in the Korogwe and Mlalo areas, the work requiring completion by that projected in southern Pare and southern Pangani.

EASTERN PROVINCE.

19. The work at the two Agricultural Experiment Stations in this Province (Mpanganya, Rufiji and Morogoro) is described in the section of the Report beginning with paragraph 63.

20. The institution of native administration in Rufiji was too recent for more to be done regarding sub-stations than to devise a scheme for the succeeding year: the district work was mainly done through highly successful demonstrations to chiefs and headmen at Mpanganya Agricultural Station,

co-operative plots with leading natives, the chief crops being cotton, maize and rice; teaching and demonstration with the aid of instructors; the introduction of improved seed; and work in school gardens, one of the schools being very usefully located on the Agricultural Station itself. With the paramount crop of the Rufiji, rice, the work has for its main objects: the teaching of simultaneous plantings of dry-land (Unyengwa) and marshland (Afa) rice, previously tested at the Agricultural Station for the purpose, to ensure a fair return whatever the season; the comparative trial of outstanding varieties; trials of lining out rice instead of broadcasting; and the demonstration of adequate cultivation. Partly on account of discouragement through the low prices of 1926, cotton-growing ceased in Eastern Rufiji, the amount of seed taken for the whole district being only 41 tons as compared with 164 in 1925, the year of highest demand: and little of this, even, was sown; the better prices of 1927, however, have brought repentance, with probably a better output. This setback is all the more regrettable, as his cotton industry is worth to the native in a normal year about £10,000, and as the reports received from the Imperial Institute and through the Empire Cotton Growing Corporation show that the quality and commercial value of Rufiji cotton are higher than those of any other cotton in the Territory. The efforts of the Department have resulted in continued improvement of the care and sanitation of the coconut plantations; and its teaching of the use of the Jat plough and the training of plough oxen by means of a sub-station at Mbwera, already begun, should help to solve the labour difficulties of the larger owners, comprising Arabs, Indians and Natives.

21. In the Morogoro and Kilosa district the work, also helped directly by an agricultural station in the area, has been carried on through the means already mentioned. For native food-crops three indigenous sorghums (Bongan hilo—early and prolific, Kilinyali and Sukesha—hard-grained, white seeded and prolific), Potchefstroom Pearl and White Congo maize—for the wetter and drier areas respectively, and Lima Abundance beans, have proved themselves suitable not only in the Agricultural Stations and native farms, but also in acceptability to native tastes, and were the chief varieties to undergo increase for wide distribution, which in the case of Kilinyali sorghum is already as much as $1\frac{1}{2}$ tons. The native potato-growing industry fostered by the Department in the Uluguru mountains is now well-established: to the extent that growers have come to like the potatoes themselves, and their consumption considerably lowers the export. The industry was introduced to the Nguru mountains, where growers by their own efforts organized by the Department quickly increased 400lbs. of "seed" to $2\frac{1}{2}$ tons, the produce from which will be partly used for further distribution. For native agriculture, again, the foundations of a native coffee industry in the Uluguru and Nguru mountains have been begun by the establishment of six nurseries for robusta, the District Officer, Morogoro, giving useful assistance for this during the absence on leave of the District Agricultural Officer; and distribution of seedlings was about to begin. Chiefly for the work for food-crops, four sub-stations were opened; there are signs that the first slow progress with these, through apathy and failure to realize their purpose, will be hastened when the benefits from them begin to be received. For the ultimate encouragement of a silk industry the best kinds of mulberry have been introduced through the Imperial Institute; and the Entomologist hopes to raise a new stock of worms by the importation of eggs from Europe.

22. The instructors used for the work at Bagamoyo were eight, each posted, except during the cotton season, at a headquarters of the Native Administration. The work of these, and of the five supplied for the Dar es Salaam District is concerned with food-crops, cotton and coconuts, in the last case instruction being combined with inspection under legislation, with the result that the condition of coconut cultivation in Dar es Salaam and Bagamoyo has improved, as in other districts. The production of food crops in the Dar es Salaam District, meeting ready sale in the coast and railway markets at Dar es Salaam and Ruvu, respectively, deserves the greater attention that will be possible when the Native Authorities are able to provide

sub-stations; and this work in sub-stations is even more urgently wanted in Bagamoyo which imported Indian rice from Zanzibar to a value of £4,783 and £2,485 in 1926 and 1927, chiefly for its coconut growers, instead of growing it itself.

23. Non-native agriculture in the Eastern Province is concerned chiefly with sisal in Morogoro, Kilosa, Dar es Salaam and Rufiji; coconuts; cotton in Morogoro and Kilosa (the largest non-native cotton area in the Territory) and some in Rufiji, and vegetables. Besides the larger areas in Dar es Salaam District there were 1,470 acres of sisal in Rufiji (western area); and it was expected that this would be increased to 2,690 acres in the next year, when it was hoped to erect a factory at Loge Loge for the treatment of the first sisal cut there since the war. The recent acquisition of coconut estates by Europeans in Bagamoyo has already had the good result of producing some improvement of the copra, through the offering of better prices for better copra by their owners. The plan of arranging co-operative experiments with planters in Morogoro and Kilosa, based on the Agricultural Station, has received a setback through the considerably increased interest in sisal that has recently taken place.

TABORA PROVINCE.

24. The principal activity of the Department continued to be in the north, in the districts of Shinyanga, Nzega and Kahama, and was carried on with the help of a new Agricultural Station at Ibadakuli (whose report receives attention in the section beginning with paragraph 93), three sub-stations (one for each district: two new), and three ploughing schools (one new). Besides the District Agricultural Officer, the staff consisted of an Agricultural Overseer (Ploughing Instructor), an Overseer, Experiment Station, and an average of twenty-nine native instructors. With regard to the last, trained and refreshed as to their knowledge and duties at the Ibadakuli Agricultural Station, it is of interest that the District Agricultural Officer was able to report: "the progress recorded throughout the year is in a large measure due to the Native Staff."

25. The work in the sub-stations is conducted on the basis of the experimental work done at the Ibadakuli Agricultural Station, which in its first season produced $6\frac{1}{3}$ tons of select kinds of tried seed for distribution, including $1\frac{1}{3}$ tons of millets, 1 ton of maizes, and $2\frac{1}{2}$ tons of different kinds of beans. Among the last, the tepary bean, introduced by the Department from Arizona as a crop for the drier conditions, showed signs of replacing other beans in native liking. The same crops, including fodder plants for dry areas, are planted at the three sub-stations for demonstration and increase, with an area at the least recently opened, also at Ibadakuli, of 67 acres, including 20 acres of cotton and groundnuts as well. In all cases the sub-stations are near central schools, so that the pupils will learn from these in addition to their own school gardens. Regarding the work through these stations the District Officer writes: "One realises the futility of delivering long addresses on Agriculture unless followed up by practical demonstrations and the development of these Stations throughout the Province heralds the dawn of a new era in Native Agriculture." The appearance however in this Eden of a tempter in the shape of a diamond industry is in some ways a matter for regret.

26. The progress through the demonstrations of ploughing and harrowing is not as encouraging. The District Officer gives as reasons for this the circumstance that falls of rain did not continue long enough to soften the ground for ploughing, lack of keenness or resources (save on the part of one Sultan), and the low wages offered to trained ploughmen; and the District Agricultural Officer agrees with him, pointing out also that plough oxen have been sold as slaughter oxen, owing to the sudden greater demand for these. Doubtless, too, the destruction of the more perishable parts of ploughing equipment by hyaenas and white ants discourages its owners to some extent; but the Department maintains a repair shop at Ibadakuli, where the work is done for them free. Of the one hundred ploughs in private ownership in

Shinyanga, thirty-seven were in use in the ploughing season for 1928, and eight in Nzega; and 816 acres in Shinyanga and 500 in Nzega were ploughed by these. Other tillage was 100 acres ploughed and cross-ploughed by this Department, 150 by the Ibadakuli Native Council, and 200 tractor-ploughed and 72 ox-ploughed by the Game Preservation Department, at a cost of Shs. 8/18 and 3/- per acre respectively (at its Lubaga Settlement Area, where it has cleared, stumped and ploughed land for a present immigration of about 70 families, for whom work in the nature of that in an agricultural sub-station is carried out by the two Departments in co-operation). As regards measures for the encouragement of ploughing among natives, the plan has been to try to lay a good foundation for its adoption by them, rather than to bring about any spectacular distribution of ploughs that will mostly become scrap-iron. The native farmer must be a free agent in this as well as in other matters; and the only basis for sound progress must be his realisation that ploughs are good for him. Progress will then be rapid.

MWANZA PROVINCE.

27. A beginning of the scheme of teaching and demonstration, and an increase of select planting material for distribution, has been made in the establishment of four sub-stations, each including a ploughing school, one for each of the Districts, and all supported from Native Council funds; and work of the same kind is done at Mwanza Central School. On account of distance and the circumstance that there is as yet only one District Agricultural Officer in the Province, one of the sub-stations was managed by the District Officer, with assistance from the Department of advice, seeds, implements and instructors; two others were conducted by an Overseer and Ploughing Instructor whose chief work was training in the ploughing school. An average of thirty native instructors was employed. The work of the sub-stations is concerned as customary with select and improved food-crops and with imported kinds of groundnuts; and at one of them (Musoma) with robusta coffee. Five and a half tons of two of the best varieties of rice were sent out by the Department, mostly for the assistance of Musoma District (and included half a ton to the Kenya Department of Agriculture).

28. The thirty ploughs in use by natives trained by the Department were increased through the importation for native use of eleven more E.C.—A. ploughs, ten pony ploughs, six indeybo ploughs and seven sets of harrows. The first-mentioned plough continues to show its superiority for the heavier cultivation; whilst the other two kinds are light, wheeled ploughs recommended to the native for the more open or already cultivated soils, only after very careful trial: no other light plough of the six additional kinds tried having shown similar suitability. The area estimated to be under the plough is 1,000 acres. It may be considered that this introduction of ploughing among native farmers is slow. But when it is realized that ploughing is entirely new, both to natives and oxen, and that the acquisition of ploughs must be entirely voluntary, with no suspicion of compulsion, it is understood that apparently slow progress in the early stages is the best foundation for the quicker extension on sound lines that native farmers' own experience will give.

29. Cotton maintains its position, gained in 1924, as the chief crop of the Province: the value of the exports was £111,402. Groundnuts are normally the second crop in importance; but an unfavourable season, together with the diversion to the new railway of groundnuts formerly received from northern Tabora together with some (about 800 tons) from the Province itself, brought the export value to £55,051, or less than that of rice, £56,576. The fall of this export value of groundnuts by £71,886 below that of the previous year was however, largely actual, and caused through the rosette disease which did great damage to plants weakened by the unfavourable season; and conditions would have been serious for the native farmer but for his possession of that most dependable of crops, cotton. As regards rice, the great production, which includes a surplus nearly equal to the export from the whole Territory, makes this crop deserve the greater attention for its improvement that, it is hoped, the resources of the Department will soon enable it to supply.

30. Non-native production in the Province is small. It consisted chiefly of cotton valued at £16,742, and of sisal mainly used for making rope but comprising an export of 2 tons. Conditions of soil, climate and water-supply that are favourable to sisal can be found in many parts of the Province.

BUKOKA PROVINCE.

31. This, with Mwanza Province and northern Tabora, comprises the Circle of the Senior Agricultural Officer stationed at Mwanza. In the Bukoba Province increase of staff now permits the interests of the fifty to sixty thousand native coffee growers, who produced 4,650 tons in 1926 and 3,944 tons in 1927, worth £324,094 and £215,845 respectively, to receive attention from a District Agricultural Officer detailed for that purpose alone, and assisted by a Coffee Officer; whilst a second District Agricultural Officer has in his charge the work with food crops, the pioneer work with cotton in Biharamulo, and (for reasons of convenience of access) that for work of the same kind in the Bugufi highlands of this District.

32. The work in the established coffee area, carried out with the aid of ten instructors belonging to the Department or the Native Administration and with that of headmen of native centres, has had the objects chiefly of improving cultivation and preparation. For the purpose, regulations drawn up by the Director of Agriculture have been adopted by the Native Authority and are the basis of instructional work; before they were put into operation their purport and intention were explained by the District Agricultural Officer at every Native Administration centre. Signs of improvement of cultivation are reported already, but as long as the work is mainly the duty of the women progress will be slow. Improvement of preparation awaits conditions when a higher price will be paid for better coffee instead of the present flat rate for "fair average quality" whose standard is maintained by the adulteration of any good coffee, that may be obtained, by bad. For encouraging this improvement legislation is to be provided to control under inspection the quality of the coffee exported; and the District Agricultural Officer expresses the opinion that the encouragement will be made more effective by the establishment of two grades for forward sales on a basis of quality. No attempt is being made for the supplanting by a wet method of the existing dry method, by which "buni" is produced; but demonstrations of small cheap pulpers such as those used by natives in the Northern Province have been made so as to interest some of the more advanced growers. As regards the comparative quality of the coffee exported, prices on the Havre market for Bukoba robusta were equal to those of Uganda native and higher than those of the Java grades reaching that market for inferior coffees; and Bukoba Arabian was just above Uganda "plantation" and considerably below Abyssinian (Mocha); whilst a sample consignment of one ton of cleaned coffee produced by a native in Kiziba, sold by the British East Africa Corporation in London, realised £78, which means a net price of about £8 a ton above the local price at the time of delivery. As regards the robusta coffee-growing begun in Bugufi, Biharamulo, 2,000 seedlings distributed to growers in four areas in 1926 are reported to be growing satisfactorily; and in 1927, 200lbs. of seed was sown in nurseries at eleven centres, the work being extended to Nahiri where conditions are similar to those of Bugufi.

33. For the Bukoba coffee area a sub-station for coffee and food-crops, and for instruction in ploughing, was opened early in the year, but abandoned for a new site chosen by the Provincial Administration near a new central school at Nyakabo (Kyamtwara), on which work of a similar nature is intended to be carried out. For the drier area of Karagwe, unsuited for coffee, work was begun for reviving the native cultivation of wheat by importing for demonstration and increase 80lbs. of the variety Kenya Governor. In the Bukoba District there are nine Government school gardens, and it is intended to use these for teaching coffee cultivation and for demonstration and distribution of food-crops in co-operation with Nyakabo sub-station. Select mulberry seed from the Imperial Institute was sown in the Bukoba school garden; and the work is to be extended to Nyakabo for

encouraging a mulberry silk industry in the Province. In the Biharamulo District seven native instructors were employed throughout the year, and in addition to that for coffee, described above, work was done for food-crops and cotton. Chiefly for the former, two sub-stations were opened, one for the coffee and one for the cotton areas, labour being obtained in co-operation with native farmers until native treasury funds are available; and increase for distribution will become effective for them in the coming year. For cotton-growing, the purpose of which is to supply the natives of Biharamulo who are not favourably placed for coffee with a cash crop (chiefly in Busubi), the pioneer ginnery erected by the British Cotton Growing Association, will provide the best means of encouragement: for the first crop 23 tons of seed have been distributed, and the District Agricultural Officer reports that the cotton was well established and growth in most cases very good. Every effort is being made to impress upon native farmers the importance of this crop to their welfare.

34. There is very little non-native agriculture in Bukoba, that which exists being concerned with nine coffee estates, which according to figures supplied by their owners, grow altogether about 500 acres of Arabian and robusta coffee, more than one-half of the area being in Arabian.

LINDI PROVINCE.

35. Dealing first with the Lindi area, for agricultural purposes this consists of the districts of Lindi, Mikindani, Newala, Masasi and Tunduru. As the establishment of native authorities was not complete in the first part of the year, the demonstration and increase of select crops was conducted with the help of individual natives and five Mission centres, the most important of the latter, dealing with special varieties of food-crops for dry areas, being at the Lukweka Farm, belonging to the U.M.C.A. Mission; and later the work was being extended, with the assistance of the District Officers, by the provision of six sub-stations for the newly constituted native authorities as well as to schools and to a seed-farm taken over by the Liwali of Lindi. The number of native instructors employed was 14. As regards cash-crops other than cotton, groundnut seed from an area free from rosette disease was distributed in Newala, to refresh a failing industry. In co-operation with the Tanganyika Transport Company, which had erected curing barns and introduced an expert from Nyasaland, two select varieties of tobacco were distributed to native farmers in the Rovuma River area of Tunduru, and the Ruwera valley of Mikindani. In common with some sisal estates in other parts of the country, certain of those in Lindi have adopted the plan of co-operative cultivation with natives, the latter keeping the land clean for young sisal by free cultivation of their food-crops on the cleared strips between the rows. So far the method is of small application; but it is of interest that on one group of estates 695 acres were kept clean by about 150 natives, who are stated to have harvested very good crops from the strips thus cultivated by them.

36. The agricultural economy of the southern coastal area of the Province (Lindi and Mikindani) possesses interest in that just over one-half of the total value (£89,382 in £173,954) is non-native production. The chief non-native product, sisal, increased in output from 1,800 tons in 1926 to 2,598, its value being £83,512, or 48 per cent. of the total value of exports; next in value were copra (£3,284) and cotton, mostly as an intercrop with sisal (£2,033). Of native production the highest in value was sesame (£40,305), followed by grains (£18,033), cotton (£10,166) and groundnuts (£7,163). The export of grains is no indication of production, as it depends upon the demand in India; that of groundnuts was lessened by an unfavourable season and their increasing use by natives as food.

37. In the Kilwa area, which comprises for agricultural purposes the districts of Kilwa, Kibata and Liwale, the native tribes cannot be blamed altogether for the complaint made against them, that they are at present very

backward and unambitious. Their little farms, often situated where conditions are sufficiently precarious from season to season through the dry climate, are raided by game and vermin to an extent that makes an increasing population possessing good physique and activity impossible; and greater food production is not only discouraged through this, but in the inland areas, by the long distances that any surplus has to be carried for sale. It is, therefore, to the credit of these people that they show enterprise in obtaining for themselves resources, certain of attainment, of intrinsic value that makes them worth distant carriage, and saleable for cash, often for food, by collecting forest products such as gum animi, wild rubber and beeswax to an extent that brings their value (£4,827) for exports to as much as one-quarter of the value of the total ordinary native exports. Their largest export is simsim, of which from the more sheltered areas in a poor year a surplus was worth £9,606 in a total value of shipments (except cotton) of £16,318. It is made plain that there is very little shipment of food-crops (except a suddenly arising export of beans worth £1,015); or of groundnuts, whose production on any useful scale in this suitable area is made difficult by pig and baboon: half a ton of seed, supplied free through the generous co-operation of Indian merchants in Kilwa was, however, distributed. The provision of roads will make for cure for these ills, stimulating production, and bringing families to congregate together: thus, with measures for reduction of game and vermin, increasing their protection from loss through these.

38. The economy of this area has received this particular description because it presents an example of a community whose lack of resources makes slow the gaining of those very means that would be most potent to help it; so that for quickening progress in the early stages some form of monetary aid besides the small funds available at native treasuries seems necessary to be devised. For the work in the year under report, seven native instructors were employed, and these accompanied the District Agricultural Officer for a course of training at the Mpanganya Agricultural Station. The District Agricultural Officer reports further that, through the instruction in itinerant work that has been given through school gardens, through "the more reliable and forceful natives," as well as by controlled issue to the villages, select food-crops have been increased for distribution. Thus, preliminary progress has been made, chiefly in increased crops through better cultivation and regular spacing, and interplanting; extension of the growing of cassava as a food resource in dry seasons; and the production of improved food-crops just mentioned. But progress is slow, and the District Agricultural Officer rightly states: "The confidence of the natives can only be obtained by practical demonstration, and for this reason the establishment of agricultural sub-stations, under the Native Administration, is eagerly awaited."

39. The value of non-native produce exported from the area (£23,872) was greater than that of native: that of mangrove bark being £17,169 (from 4,195 tons), the rest being the value of copra. With regard to the latter, as on the greater part of the coast, increased inspection and more rigid enforcement of regulations have led to improvement of the coconut plantations.

KIGOMA PROVINCE.

40. Increase of staff enabled a District Agricultural Officer to be provided for the work which, virtually concerned with robusta coffee alone, was confined to Kasulu and Kibondo Districts, and carried on directly by the District Officers with the help of an Overseer, Experimental Stations. After the arrival of the District Agricultural Officer, a staff of seven native instructors was obtained, in addition to the nurserymen for the coffee nurseries, already employed. The work proposed comprises the improvement of food-crops, including good maize and early millets, by the means employed in other districts; the introduction of coffee as a cash crop in individual ownership in the highlands; encouragement of suitable cash crops such as simsim, groundnuts, soybeans, potatoes and ginger, mostly for the

lowlands; and the introduction of the use of light ploughs. As centres of work, demonstration and seed farms started by the enterprise of some of the chiefs, land near the coffee nurseries, Government school gardens, and Mission school gardens are employed, the native administration system not yet being in possession of sufficient funds for extensive work. For that with coffee the numbers of seedlings distributed were 4,850 and 740, and the quantities of seed sown 57lbs. and 28lbs., for Kasulu and Kibondo respectively; and it is expected for next season that there will be nearly 20,000 seedlings ready for distribution. The whole of the Kasulu highlands area is now provided with robusta coffee nurseries, no place there being more than a day's journey from a nursery.

IRINGA PROVINCE.

41. Until one Agricultural Officer at least is stationed in the Province, little can be done for native agriculture. There is need for the introduction of crops whose value will bear long transportation; and there will be necessary closer attention to their own food-crops by natives, not only for improvement, but for increase for feeding labour in a growing non-native plantation industry. For the former need, coffee (at the instance of the Governor) and tobacco were chosen. Nurseries of robusta coffee were made by the District Officers, Tukuyu and Mbeya, with seed supplied by the Department; and for the work with tobacco, in Mbeya, two native instructors, with a suitable supply of tobacco seed, were obtained from Nyasaland with the assistance of the Director of Agriculture. Non-native planters have continued to be supplied with seed, chiefly of tobacco (of choice kinds, partly from the Morogoro Agricultural Station), mixed-farming crops and dry-land fodders; and they have been given a considerable amount of advice for their particular conditions.

42. During the dry season of the year a general agricultural survey was made in the Province by the Deputy Director; and as a result general information as to areas suitable for plantation crops became available. This is to be followed by a more detailed survey of the same areas during and after the harvest of 1928. It is intended to obtain from South Africa one or more District Agricultural Officers possessing expert knowledge of tobacco for the assistance of planters and superintending the work for this crop with natives; and it is hoped that the Department will be able to afford similar help for tea.

MAHENGE PROVINCE.

43. The conditions of the remoteness of this Province, shared with Iringa, have caused in the same way a robusta coffee industry to be started for natives in 1926, and steps to be taken for the improvement of their tobacco industry, the former in Songea and Mahenge, and the latter in Songea. For coffee, seed was supplied and sown in nurseries at four centres, from which 3,000 seedlings will be available for distribution at the end of the year, a trained instructor to train others was also provided by the Department; and the sending of additional men to Moshi for further training was also projected. For tobacco, a District Agricultural Officer was sent to Nyasaland, to gain a close knowledge, with the valued assistance of the Director of Agriculture, of the production of tobacco for export by natives in that country; and his services will be available for Mahenge as well. The great agricultural possibilities and the growing importance of this latter district owing to its more ready accessibility by the new motor road from the Central Railway at Kilosa justify, however, the provision of a District Agricultural Officer for its own needs.

44. There is no non-native agriculture of importance in this Province. An agricultural survey is, however, to be made in Songea in order to obtain knowledge of its possibilities in this respect.

GENERAL MATTERS.

45. It is seen from these reports regarding progress in the various Provinces that in most of the districts a good foundation has been laid for the development and improvement of native agriculture through the Native Authorities that have been constituted : a plan described at length in the last Annual Report (paragraph 45). Both for this and for non-native agriculture the work is being extended and made more efficacious through the increase of the staff of District Agricultural Officers by the appointment of men with agricultural training, who have already had experience of tropical crops gained either at the Imperial College of Tropical Agriculture in Trinidad, or in specialist posts that they have held in other countries. Especially for the assistance of the quickly increasing non-native agriculture of the south-western area (Iringa), it is intended to add to the existing north-eastern centre (Lushoto) and north-western centre (Mwanza) Agricultural Circles in charge of a senior Agricultural Officer, a south-western Circle in similar charge. Both plantation and native agriculture will be afforded additional assistance, too, by the acquisition of an officer at Agricultural Headquarters for giving much-needed help with the economic work, especially for the examination and study of promising indigenous and introduced economic crops, and the collation of the results of the observations and trials of them made in the Agricultural Stations of the Territory. For the diseases and pests of plants, all kinds of agriculture in the country have been placed in a safer position by the recent acquisition of a Mycologist and an Assistant Entomologist.

46. The control in the hands of the Department of the distribution of cotton seed to natives continues to be justified by the maintenance of the high quality of the cotton produced in the Territory. The decrease in the quantity of the seed distributed in 1927, caused mainly by the lower prices of 1926, has been more than made up for through the higher prices of the season of 1927, as is shown in the following table, which gives the cotton seed distribution to natives in the years mentioned :—

Region	1923	1924	1925	1926	1927	1928
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Arusha District	2 $\frac{3}{4}$	1	1 $\frac{1}{2}$	2	—	—
Moshi District	3 $\frac{1}{4}$	8	11 $\frac{1}{4}$	5 $\frac{1}{2}$	4 $\frac{1}{4}$	14 $\frac{1}{4}$
Dar es Salaam District...	4	13	25	29	27	11 $\frac{3}{4}$
Bagamoyo District	25	34	37	48	44	53 $\frac{1}{2}$
Morogoro and Kilosa Districts	84	208	199	128	84	165
Rufiji District... ..	70	120	164	132	41	45
Tabora Province	10	68	200	160	113 $\frac{1}{2}$	164 $\frac{1}{2}$
Mwanza Province	140	338	447	455	545	569
Tanga District	$\frac{1}{2}$	2	8	4 $\frac{1}{4}$	—	—
Usambara District... ..	$\frac{3}{4}$	2	$\frac{1}{2}$	$\frac{1}{2}$	—	—
Pangani and Handeni Districts	3	8	50	47	33	32 $\frac{1}{2}$
Kilwa District	20	60	81	80	29	48
Lindi and Mikindani Districts	113	160	340	208	95	121 $\frac{3}{4}$
Iringa Province	—	—	6 $\frac{1}{4}$	—	—	—
Mahenge Province... ..	3	5	22 $\frac{3}{4}$	3	—	—
Bukoba Province... ..	2	20	1	65 $\frac{1}{2}$	25	23
Total ...	481 $\frac{1}{4}$	1,047	1,594 $\frac{1}{4}$	1,367 $\frac{3}{4}$	1,040 $\frac{3}{4}$	1,248 $\frac{1}{4}$

The quantity of cotton seed estimated to have been planted by non-natives in 1928 is about 400 tons, as compared with 442, 411 and 274 in the years 1925 to 1927, respectively.

47. The activity in sisal and coffee, mentioned in the last Annual Report, continues : for the latter, new land is being opened in Rungwe (Iringa), and for the former, there is considerable extension in the Eastern

Province, old Ceara rubber lands and ruinate sisal areas having in several cases been cleared for the purpose. The area of ex-enemy estates and of agricultural land on long lease, held and disposed of up to the end of 1927, was 1,183,435 and 272,320 acres, respectively.

48. The table given at the beginning of the section dealing with the progress of the chief export crops (paragraph 104) shows that sisal passed the stage of an export worth one million sterling, as was expected; and that coffee maintained its position as the export second in importance, 60 per cent. by weight and 47 per cent. by value coming from the native industry of Bukoba, whilst the similar industry of the Northern Province increased its export in the last two crop years from 98 tons to 400 tons in a total output of 2,614 from that Province and the Usambaras. In spite of its set-back cotton maintained its position as third; whilst hides and skins exchanged its position with groundnuts as fourth. Copra continues to show a steady decline, but remains at sixth. Better prices for beeswax have brought its export back to the figure of 1913. Simsim and rice are each about twice the value, for export, of gold. Useful evidence as to the good quality of these products was afforded by the high praise given to them at the Agricultural Show, Nairobi, 1927, in respect of both private exhibits and the Government display, the latter prepared by the Deputy Director and taken care of at Nairobi by the District Agricultural Officer, Moshi.

49. *Maintenance of the Quality of Cotton.*—The check on the quality of the crop, obtained with the help of the Imperial Institute and the British Cotton Research Association and Liverpool Brokers (through the Empire Cotton Growing Corporation) through the examination of samples, continues to show that this is well maintained. It is not intended to give the detailed tables of the results of examination as was done in former reports, as these are published in the local press and are available for reference. The reports from the Imperial Institute are similar in nature to those of former years. It is of interest that the Brokers' Reports in the preliminary examination of samples arranged by the Corporation show that the order of merit, beginning with the best, was: Pangani (ordinary), Morogoro (ordinary), Ukerewe Island, Rovuma area, Morogoro (Turiani), Lindi (ordinary), Kilwa (Njinjo), Pangani (Tongwe), Kilwa (ordinary), Mwanza (Uzinza), Mwanza (Usmau), Handeni (Negero), Shinyanga (Lubago) and Shinyanga (ordinary), the last two being equal; whilst the strongest cottons came from Morogoro and Ukerewe Island, and those of the best staple from Morogoro, Ukerewe Island, Lindi and Pangani. Three samples were sent from Rufiji in order to compare two of the late Cotton Specialist's selections (J and Mp 9/2) being considered for replacement of the M selection discarded, with the ordinary district cotton; and whilst Brokers' Reports showed that the order of merit was: J, Mp 9/2, ordinary, the Research Association's tests indicated that Mp 9/2 had the best staple length, followed by J and ordinary in order; altogether the tests appear to show that J is sufficiently superior to the ordinary to merit increase for replacing the latter in the district.

MARKETING IMPROVEMENT AND EXTENSION.

50. The system by which seed-cotton is marketed, in addition to the selling at ginneries, was described shortly in the last report: it consists of selling in free markets and (where the production is smaller) at auction markets. For encouraging cotton-growing in new areas remote from ginneries and markets, a system permitting the nearest ginnery to buy at a ginnery post serving the area has been devised. Where no provision of any kind exists for buying, encouragement is given to the erection of pioneer ginneries of a simple type less costly than the ordinary ginnery, as in the case of Biharamulo, described in paragraph 33. For matters connected with the erection of ginneries and cotton marketing, the assistance is now available of a Cotton Advisory Board, on which the cotton interests in the principal cotton-producing areas, Morogoro, Kilosa and Mwanza, and the Government, are represented.

51. The sales of seed-cotton by natives during the season are shown in the following table :—

Area	1st Quality	2nd Quality	3rd Quality	Total	Value
	Kgs.	Kgs.	Kgs.	Kgs.	Shs.
Morogoro and Kilosa ...	1,182,386	134,887	319,072	1,636,345	768,754
Lindi	279,569	52,436	88,078	420,083	165,321
Kilwa... ..	24,010	10,190	17,494	51,694	20,678
Rufiji	3,612	5,500	3,499	12,612	4,000
Dar es Salaam	7,720	12,344	5,131	25,195	11,044
Bagamoyo	80,671	14,205	7,650	102,526	46,900
Pangani and Handeni	63,425	4,462	4,494	72,381	29,547
Tabora Province	388,678	71,979	63,036	523,693	214,285
Mwanza Province	2,840,345	—	627,834	3,468,179	1,515,960
Moshi... ..	72,056	7,656	4,455	84,167	53,429

52. MOROGORO AND KILOSA DISTRICTS : Buying took place at the well-established central cotton markets and at ginnery posts (described above) at Turiani and Kisaki. Progress during the past four years is shown in the following table, the decrease in 1925 being due to an unusually dry season, and that in 1927 to low prices in 1926 :—

	1922	1924	1925	1926	1927
Weight in tons of unginned cotton	149	2,165	1,844	3,426	1,610½
Value in £	3,170	63,797	48,137	52,120	38,437

53. LINDI : Buying was at three cotton markets in Lindi District and one in Mikindani District, and at a ginnery post at Masasi. The production of lint was as follows : native, 131,879 kgs., as compared with 218,973 kgs. in 1926; non-native, 22,948 and 35,378 kgs. for the same respective years : the decrease being due to an unfavourable season as well as the previous low prices.

54. KILWA : The cotton was again sold by auction at Kilwa, Kiswere and Samanga; and as the only ginnery, that at Kikanda, was closed, the seed-cotton had to be sent to Lindi to be ginned, lowering the price in a way to add to the discouragement through the low prices of the previous year, although the prices obtained at the auctions were good under the circumstances. The quantity and value of the seed-cotton recorded as sold in the table in paragraph 51 may be compared with those of 1926 : 164,257 kgs. and Shs. 42,796/-.

55. RUFJI : Partly on account of the low prices of the previous year, and also because of comparison with those of neighbouring areas in the same year (lower in Rufiji on account of remoteness), the season saw a tragic fall in production to 12 tons of seed-cotton, of which none was produced in Eastern Rufiji, from an out-turn which had reached as much as 506 tons in 1924, the best year. As indicated already, however, there are signs that good prices will revive production in this area.

56. DAR ES SALAAM : The production was 22,800 kgs. of lint. The high prices obtainable for food-crops in this district prevents extension of the areas in cotton; but when a District Agricultural Officer is available for this district (together with Bagamoyo), native farmers will be taught the advantage of including cotton in the areas prepared for their crops.

57. BAGAMOYO : The native production increased from 246 tons of seed-cotton to 260, and the non-native from 21 to 41 tons, the latter being produced by the Mission owning the Bagamoyo ginnery, which bought all the native cotton there and at Sadani. The satisfactory prices received are likely to cause a considerable increase of output in 1928.

58. **PANGANI AND HANDENI**: The native farmers of Pangani produced 58,000 kgs. of seed-cotton worth Shs. 24,872/-; and those of Handeni 13,581 kgs., for which they received Shs. 4,676/-.

59. **TABORA PROVINCE**: Cotton auction markets were held at three centres in Shinyanga District, and at one each in the Nzega and Kahama Districts, in addition to the ordinary selling at Usogore and Lohumbo ginneries; but after the first auction there was no bid for one of the centres in Shinyanga and for those in Nzega and Kahama, and the cotton from the areas intended to be served was sold at Lohumbo ginnery. The seed-cotton sold in Shinyanga was 722,023lbs., worth Shs. 133,598/-, and that in Nzega 4,243lbs., value Shs. 246/-, and that in Kahama 642lbs., value Shs. 51/-; whilst the rest was bought at Usogore and Lohumbo ginneries, the quantities and values being 420,589lbs. and Shs. 80,070/-, and 19,592lbs. and Shs. 2,319/-, respectively.

60. **MWANZA PROVINCE**: The seed-cotton was bought at ten ginneries, fifteen cotton markets and one cotton auction market (Musoma), the total quantity being 3,467 tons, for which £75,795 was paid; similar figures in the best year, 1925, were 4,979 tons and £106,112.

61. **MOSHI**: The seed-cotton was bought at Himo and Moshi ginneries, and at posts belonging to these ginneries at Kisangiro, Northern Pare. The figures of sales given in the table in paragraph 51 include a small output of 506 kgs. in Mbulu

62. *Range of Prices.*—These are shown in the following table, the qualities being those defined in former reports. The prices are in cents of a shilling per kilogram:—

Centre	1st Quality		2nd Quality		3rd Quality	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
Morogoro						
Ngerengere						
Kilosa						
Dar es Salaam	71	35	61	25	35	17
Bagamoyo	58	50	46	26	24	16
Mohoro ... ..	...	...	...	...	...	...
Kikale ... ..	...	...	...	...	...	...
Kilimani	45	45	33	33	16	16
Lindi	52	50	42	40	29	25
Mikindani	45	38	37	28	24	20
Masasi	50	41	35	33	15	15
Kilwa	61	46	51	36	30½	23
Mwanza	62	38	...	...	28	11
Usogore (Shinyanga)	53	42	44	33	22	17
Pangani	48	38	32	25	8	8
Moshi	85	45	60	30	60	10

In the case of the three first-mentioned centres, the figures for maximum and minimum are not available. The “average” prices were:—

Morogoro	57	46	26
Ngerengere	54	44	27
Kilosa	60	47	28

WORK IN AGRICULTURAL STATIONS.

63. This section of the Report presents a summary of the work at the Agricultural Stations. The details are available for enquirers at the Head Office and at the Stations concerned.

MOROGORO AGRICULTURAL STATION.

64. The following is taken from the report of the District Agricultural Officer, Morogoro.

65. The trials of previous years were continued, and certain new trials and experiments were added. It was also possible to multiply seed of various tested crops for distribution. The following sections give a summary of the more important trials.

66. *Cotton: Variety Trials.*—The most noteworthy feature of this experiment is that the local variety of Uganda has out-yielded all introductions. Of the fourteen kinds in the trial, namely district cotton as control, King, Over-the-top, Rufiji Selection M, Foster x Whitehall, N 17, Rustenburg O (these last four being grown for the first time), R.M. 68, Griffin, Improved Bancroft, R.M. 53, Watt's Long Staple, R.M. 90 and Webber 49, the ordinary district cotton gave the best yield, and of the improved varieties none has shown outstanding merit that would justify multiplication for replacement, although R.M. 68 is promising.

67. *Cotton: Time of Sowing Experiment.*—The following is a summary:—

Date of Planting	Yields per Acre		
	1st Series	2nd Series	Average
	Kgs.	Kgs.	Kgs.
February 1, 1927	215	358	287
" 15, 1927	274	433	353
" 22, 1927	263	424	343
March 1, 1927	254	420	337
" 8, 1927	406	444	425
" 22, 1927	390	340	365
April 5, 1927	72	—	72

The following gives the rainfall for the critical period of the experiment. The rains opened late in the season, and February was exceptionally dry.

FEBRUARY: Two showers on 16th and 28th. Total ... 3·8 mm.

MARCH: Light showers on 1st, 2nd and 9th.

Continuous moderate rain 12th to 22nd.

22nd to 31st, only traces of rain.

Total ... 186·3 mm.

APRIL: 2nd, 18·8 mm.

3rd to 8th, light showers.

9th, 14 mm.

10th to 16th, light showers.

17th and 18th, 24·6 and 22·2 mm.

20th, 15·6 mm.

Continuous showers till 24th.

24th and 25th, heavy falls, 18 mm. and 40·7 mm.

Total ... 190·6 mm.

The experiment bears out the results of previous trials, namely, that it is advisable to plant cotton in Morogoro as soon as the rains break, and that it does not answer to delay planting beyond the end of March. The earliest plantings about the time of the opening rains have again given the heaviest yields. It is interesting to note that the four first plantings which were made before the rains opened have given quite good yields, and three of them are almost the same within the limits of experimental error. The conclusion, drawn from a consideration of the results of this experiment over a period of several years together with rainfall statistics, is that where a large acreage is to be planted, it is advisable to begin planting about

February 15th, even if the rains have not begun, and not to continue planting beyond the end of March. Where only a small acreage is to be planted and labour is adequate, planting is best done with the first good rain after the beginning of February, say, about the 10th. These arbitrary dates are considered useful guides

68. *Cotton: Distance of Sowing Experiment.*—The continuation of the experiment gave the following results, the trial being with rows 3ft. apart and in duplicate :—

Spacing in Inches	Plants per Hill	Comparative Yield
6	1	100
9	1	69
12	1	76
18	2	75
24	2	59
30	2	48
6	1	65
9	1	100
12	1	81
18	2	91
24	2	54
30	2	60

The results continue to indicate that the smaller spacing gives the best yields, whether it is attained by closer planting, or by this together with leaving two plants in a stand

69. *Maize Experiments.*—All maize on the station suffered very badly owing to the very unfavourable season, and much of the experimental work was rendered valueless. The varieties included in the variety trial were Potchefstroom Pearl, White Congo, and the local native maize. This maize was planted in January, and owing to the dry hot period in February, was a failure.

70. *Quick-maturing Legumes.*—An attempt was made to grow quick-maturing legumes with the short rains, in order to test a means of supplying an early source of food at a time when food is particularly scarce amongst natives. The trial was conducted with five different leguminous crops all grown under the same conditions. A summary of the results is given below. The date of planting was 21st October, 1926 :—

Crop	Order of Maturity	Yields per Acre	Rainfall during trial millimetres
		Kgs.	
Local gram	II	107	October — Nil
Tepary beans	I	96	November — 47·7
Black gram	III	68	December — 70·3
Local kidney	IV	20	January — 133·3
Local cowpeas	V	14	February — 3·8
			March 10th— 11·5
			266·6

It will be seen that the three earliest to reach maturity have given the best results. Although such early planting is speculative, it has been demonstrated that it is possible to obtain a harvest of either of the grams or tepary beans with about 10 inches of rain.

71. *Miscellaneous Leguminous Crops.*—The object of this experiment was to ascertain the relative value of various legumes as crops for the production of food, when planted towards the end of the rainy season, which is the normal planting time here. The date of planting was 25th April, 1927 :—

Crop	Growing Period	Calculated Yield per Acre
	Days	Kgs.
Velvet bean	125 to 171	658
Lima beans	103 to 164	350
Madagascar	103 to 164	130
Kidney beans	68 to 80	108
Black gram	81 to 109	107
Local gram	70 to 139	31
Cowpeas	81 to 140	16

Lima bean (var. Abundance) has yielded consistently well for several seasons, and has now been introduced into native and non-native cultivation in the district. The Madagascar butter bean is very similar to Lima Abundance, but the yields are consistently lower. Kidney bean is an improved variety of the local "Maharagwe," the miscellaneous coloured strains of *Phaseolus lunatus*. Yields with this bean not grown in the hills are usually low; but its value to natives lies in its quick maturity, and in this connection it figured in the short-rain trials above. Black gram (*Phaseolus radiatus*), introduced from Surat as insect-resistant and suitable for storage, was grown for one season at Morogoro. In the field it has certainly withstood aphid and beetle attack better than the local green-seed variety. The yields from green gram and cowpeas were insignificant, chiefly on account of attack of aphid late in the season. The trial of tepary beans for time of planting has not yet given definite results.

72. *Sorghum: Variety Trials*.—With quick-maturing types, through low germination of the imported seed and dry weather, no useful results were obtained; but, as the District Agricultural Officer points out, the trials are worth continuation for finding early-maturing varieties that will give good yields. With heavy-yielding types, results should necessarily be read as following on the work of 1926. The object of the experiment was to ascertain (a) the heaviest-yielding varieties, and (b) the heaviest-yielding hard-grained varieties. The date of planting was 1st April, 1927. Class I: Heavy-yielding, hard-grained varieties suitable for storage or export:—

Variety	Yield per Acre	1926 Yield per Acre.
	Kgs.	Kgs.
Kilinyali	585	488
Suksha	497	534
Ngolongo	235	171
Karachi*	95	119
Bangala*	43	not grown

*Local varieties.

Class II: Heavy-yielding varieties for consumption as food by growers, not necessarily suitable for export or storage (the above varieties are also included in this class, but soft-grained varieties are added):—

Variety	Yield per Acre	1926 Yield per Acre
	Kgs.	Kgs.
Bonganhilo	951	614
Kilinyali	585	488
Ngwana Kwimba	510	409
Suksha	497	534
Kihembahemba*	404	not grown
Ngolongo	235	171
Red U.S.A.	117	63
Karachi*	95	119
Bangala*	43	not grown
Kufe*	10	"
Kwamba*	8	"
Mdura*	8	"

*Local varieties.

Kilinyali is a variety of sorghum which was introduced to this station from Shinyanga in 1925. In 1926 it gave the second highest yield of any of the

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77. The experiments were carried out on the two blocks which compose the station: A, representative of the upland riverine soils; and B, representative of the lowland conditions of the Rufiji District. The following account of them is taken from the reports of the District Agricultural Officers who were successively in charge.

78. *Cotton: Time of Sowing Experiment, Section A.*—Duplicate 1/40 acre plots were sown at fortnightly intervals beginning with 8th January, 1927, and ending with 28th May, 1927, as in the previous year. The following results were obtained:—

Plot Number	Time of Sowing		Monthly Rainfall in Millimetres		Percentage Stand	Comparative Yield
1	January	8	January	153.2	84.6	70.8 (V)
2	"	22	February	49.7	64.5	100.0 (I)
3	February	5	March	317.8	18.5	58.4 (VII)
4	"	19	April	296.7	89.7	90.2 (II)
5	March	5	May	21.9	92.4	89.5 (III)
6	"	19	June	Nil	80.3	58.1 (VIII)
7	April	2	July	3.0	92.2	57.7 (IX)
8	"	16	August	0.5	98.7	77.2 (IV)
9	"	30	September	11.0	82.9	64.4 (VI)
10	May	14	October	24.1	61.6	34.5 (X)
11	"	28	November	93.2	Nil	Nil

The periods from sowing to germination, from sowing to first flowers, and from sowing to opening of bolls, are as follows:—

Plot Number	Number of Days to Germination	Number of Days to First Flowers	Number of Days to First Opening of Bolls
1	3	46	120
2	5	49	114
3	14	66	120
4	9	61	120
5	4	55	109
6	4	53	110
7	4	56	110
8	4	56	104
9	5	61	119
10	4	58	129

The experiment mainly bears out the results of previous years, in that the maximum yields of cotton are obtained from that which is sown sufficiently early to produce its first flowers before the end of the rains, as with plots Nos. 1 to 5. The yield of plot No. 3 is low because of a poor stand, the rains being scant and unfavourable at sowing; commercially, such cotton would be re-sown at the first favourable opportunity. It may be laid down that the optimum period for the sowing of the cotton crop lies over the last week in January to the first week in March, for the light upland soils of the Rufiji Valley. The optimum times of sowing over the last six years are correlated below:—

Year	Optimum Time of Sowing	Yield per Acre of Seed-Cotton Lb.
1922	March 5	—
1923	" 1	—
1924	" 24	—
1925	" 3	1,136
1926	February 5	812
1927	January 22	692

From the years 1922 to 1924 inclusive, it should be noted that the plots showing the optimum time of sowing were the first-sown plots; hence the above dates for those years cannot be regarded as the true optimum times of sowing, as the first dates were not sufficiently early.

79. *Cotton: Time of Sowing Experiment, Section B.*—Duplicate 1/40 acre plots were sown at fortnightly intervals as in section A. The following results were obtained :—

Plot Number	Time of Sowing		Monthly Rainfall in Millimetres		Number of Days to First Opening of Bolls	Percentage Stand	Comparative Yield
1	January	8	January	153.2	112	88.0	85.4 (IV)
2	"	22	February	49.7	101	84.8	100.0 (I)
3	February	5	March	317.8	108	22.3	89.9 (II)
4	"	19	April	296.7	117	90.8	86.6 (III)
5	March	5	May	21.9	102	90.0	64.0 (VII)
6	"	19	June	Nil	102	89.1	78.5 (VI)
7	April	2	July	3.0	113	46.2	79.2 (V)
8	"	16	August	0.5	115	60.1	33.0 (IX)
9	"	30	September	11.0	115	98.2	49.0 (VIII)
10	May	14	October	24.1	103	60.2	16.9 (X)
11	"	28	November	93.2	...	Nil	Nil

It should be mentioned that the soil of field 3, section B, where the above experiment was carried out is of a light nature; hence it is well aerated, and there is less denitrification than in the fine silt soils. The results of the experiment are similar to those of the same experiment of section A. But the period over which cotton may profitably be sown is prolonged by one month, because of the greater powers of water-retention of these soils over that of the coarser soil of section A.

80. *Cotton: Distance of Sowing Experiment.*—A series of eleven duplicated plots of different spacings were sown on 16th February in both sections A and B, while a repetition experiment was sown in section B on 18th April, the different series of plots being known as series A, B and C respectively. The number of plants per acre at the different spacings (given to the nearest 500), and the results of the experimentation are shown in the following table :—

Plot Number	Spacing	Number of Plants per Acre	Comparative Yields.		
			Series A	Series B	Series C
1	3 ft. by 6 in.	32,500	66.3	30.0	64.4
2	3 ft. by 9 in.	21,500	65.9	57.3	84.4
3	3 ft. by 12 in.	16,500	100.0	84.4	100.0
4	3 ft. by 18 in.	9,500	58.6	94.8	91.2
5	3 ft. by 24 in.	8,000	65.0	100.0	75.4
6	3 ft. by 30 in.	6,000	63.7	54.7	83.0
7	4 ft. by 36 in.	4,000	66.3	50.8	55.4
8	2½ ft. by 6 in.	38,500	35.6	39.6	91.8
9	2½ ft. by 12 in.	26,500	42.2	56.1	78.1
10	2½ ft. by 18 in.	21,000	56.9	56.0	45.9
11	2½ ft. by 24 in.	10,500	32.7	72.8	21.3

In series A, that is with the sandy soils of the uplands of the Rufiji Valley, the spacing of 3ft. by 12ins. gave the best results. This spacing is outstanding in effect; otherwise the experiment tells but little. The behaviour of the series B and C, carried out in section B, is more illuminating. Soil-denitrification, which was so marked a feature of the experimentation of the previous year, was less pronounced, and hence the results were what one would expect. The spacings of 3ft. by 24ins. gave the best results with the earlier-sown series, while the spacing of 3ft. by 12ins. gave the highest yield with the late-sown series C.

81. *Cotton Variety Trials.*—The cotton variety trials were carried out in small isolated plots (at distances of seventy yards apart to prevent crossing) from which comparative results as yields per plant were obtained, and a sufficient supply of seed ensured for the next season. The results are given below. Griffin again took first place as in the previous year, the Uganda

variety maintained its high yield, while Improved Bancroft did far better than previously. Uganda 17 and Watts Long-Staple were also good. Both the Webber strains were disappointing.

Plot Number	Variety	Yield per Plant	Date of Opening of Bolls
		Ozs.	
A	Webber 49 (Baghdad)	0.91 (XIII)	June 16
B	Webber	3.09 (VI)	" 16
C	Early King (King 29)	1.52 (XI)	" 15
D	R.M. 53 (Baghdad)	1.90 (VIII)	" 21
E	R.M. 68 "	2.73 (VII)	" 27
F	R.M. 90 "	1.67 (X)	" 28
G	Improved Bancroft	6.70 (II)	" 30
H	Griffin	7.88 (I)	" 23
I	Uganda	5.63 (IV)	" 14
J	Watt's Long-Staple	5.37 (V)	" 20
T	Uganda 17	6.00 (III)	" 22
U	Ordinary District... ..	1.82 (IX)	July 7
V	Rustenburg O	0.80 (XIV)	June 25
W	Foster X Whitehall	1.02 (XII)	" 15

82. Comparison of the Mp. Selections with Ordinary District Cotton.—

The Mp. cotton selections were sown in 1/40 acre plots in sections A and B, the main object being the maintenance of pure seed stocks, the plots being seventy yards apart. At the same time comparative yields per plant were obtained, the results being as follows:—

Cotton Selection	Yields per Plant	
	Section A	Section B
	Kgs.	Kgs.
Mp. 9	0.008 (VII)	0.010 (V)
Mp. 19	0.035 (I)	0.049 (I)
Mp. 8/1	0.020 (II)	0.047 (II)
Mp. 9/2	0.013 (V)	0.009 (VI)
Mp. 12	0.016 (IV)	0.008 (VII)
Mp. 18	0.011 (VI)	Destroyed by flood
Mp. 4/2	0.008 (VII)	0.023 (IV)
Mp. 13/3	0.019 (III)	0.025 (III)
Ordinary District	0.006 (IX)	Destroyed by flood

In comparison with the trials of former years, the low position of Mp. 9/2 is most striking, this strain having given the greatest yield in the two previous years. Mp. 19 and Mp. 13/3 maintained their high places in the table of yields.

83. *Ratooning of Cotton Experiment, Section A.*—The experimental cotton plots of 1926 were cut back to ground level at the time when such cotton would have been normally uprooted and burnt. The plants quickly sprouted and were in flower five weeks after ratooning. Bollworm was first observed on 14th February, and stainers on 2nd March; both were in large numbers by April. Comparisons of yield with those of the previous year's crop from the same plots, and with ordinary cotton of 1927, and also figures showing the incidence of insect pests, are given in the following tables:—

Year of Crop	Actual Yield	Comparative Yield
	Lb.	Lb.
A. Ordinary cotton of 1926	400.0	82.3
B. Cotton A above ratooned, picked 1927	29.7	6.1
C. Ordinary cotton of 1927	485.5	100.0

MONTH	Number of Stainers per Plant		Percentage of Bolls containing worm	
	Ratooned Cotton	Ordinary Cotton of 1927	Ratooned Cotton	Ordinary Cotton of 1927
February	Nil	Nil	36.0	Nil
March	8.7	Nil	51.7	32.3
April	10.2	2.0	84.5	60.0
May	9.1	4.0	80.0	78.5
June	2.0	6.2	48.5	71.5
July	12.1	4.5	91.0	91.0
August	17.5	3.7	56.4	83.6
September	8.0	1.0	86.0	79.0
October	12.7	3.0	70.0	41.0

84. *Topping of Cotton Experiment, Sections A and B.*—Four duplicate plots were sown in each section, duplicate plots being topped at 1ft., 2ft., and 3ft. high, the fourth pair of plots acting as controls. The results are given in the following table:—

Plot					Section A	Section B
					Lb.	Lb.
Topped at 1 ft.	...	...	...	...	6.68	15.00
Topped at 2 ft.	...	...	...	...	9.50	16.50
Topped at 3 ft.	...	...	...	...	8.43	14.15
Control	...	...	...	...	13.50	17.00

This very completely bears out the results of past years in that topping the cotton plant produces no increase in yield; rather does it result in a decrease.

85. *Cotton with Rice Experiment, Section B.*—Equal areas of Unyengwa, Marula and Afa varieties of rice were sown in section B, on 11th January, at 18ins. by 9ins. These areas were equally divided into three plots, one of which was a control, and was not sown with cotton. Cotton was planted in between alternate rows of the second plots on 18th March, and cotton was planted in between alternate rows of the third plots on 18th April, the cotton being spaced at 3ft. by 18ins. With the heavy rains of March and April (March 317.8 mm., April 296.7 mm.) the area on which the experiment was being carried out became waterlogged, and rainwater formed a standing pool. The rice plants grew very tall (Unyengwa, 4ft. 6ins.; Marula, 6ft.; and Afa, 5ft.) and completely closed the rows, shutting out all light, and the rice stalks were too weak to bear the weight of the forming ears and bent over, many lying flat. When the rice stalks were cut out after harvest very few cotton plants were found, and these only in the March plantings. The control plot yielded 1,071kgs. of grain per acre, the plot inter-sown with cotton in March, 1,008kgs., and the plot inter-sown with cotton in April, 1,065kgs. Unfortunately a plague of rats destroyed all the inter-sown cotton, and made it impossible to give the yields from it.

86. *Cutting Back of Cotton Experiment.*—The object is to determine as far as possible how the loss of moisture through leaf transpiration may be controlled. Duplicate plots with controls were sown as early as possible on 18th January, in order that a maximum root system should be formed before cutting; and when the plants had reached the woody stage, which was on 11th April, the plots other than the controls were cut back to ground level. The plants were 3ft. high at this stage. In section A, the average yield of the control plots of normally grown cotton was 24.9lbs., while that of the plots cut back was 14.1lbs. In section B the cutting back resulted in a yield of 3.3lbs. only, as compared to 22.4lbs. of the control plots. The experiment indicates that while in a normal year cutting back of early-sown cotton merely results in a decrease of yield, the method is at least practical,

and in the case of cotton attacked by thrips such cotton could be advantageously cut back, for by the time the plant recovers and flowers again all danger of thrips will be passed, and healthy cotton will be produced.

87. *Rice Variety Trials*.—Twenty-two local varieties of rice were sown in triple-line plots in duplicate at spacings of 18ins. by 9ins., in continuation and extension of the trials carried out last season. The trials were carried out in section B. The feature of the growing season was the heavy rainfall during March and April (317·8 and 296·7 mm. respectively), when the soil became waterlogged and rainwater stood on the area sown. The plants grew very tall, and when the ears began to form they became top-heavy, in many cases falling over, and in some cases lying flat. Vegetative characters were studied and, along with the yields, are given below.

Number	Name of Variety				Height of Stalk		Awn Character	Habit of Growth	Leaf Character
					ft.	in			
1	Africa	...	...	...	5	6	Awnless	Drooping	Broad
2	Marula	...	...	...	5	9	"	Upright	"
3	Ngowe	...	...	...	5	10	Awned (red)	"	"
4	Meno Meupe	...	...	...	6	0	Awnless	Drooping	"
5	Kilimali	...	...	...	6	0	"	Upright	"
6	Jegerenati	...	...	...	5	6	"	Drooping	Medium
7	Kimoto	...	...	...	5	6	"	Upright	Fine
8	Afiri	...	...	...	6	0	"	"	Medium
9	Unyengwa	...	...	...	4	10	"	Drooping	"
10	Nwanga	...	...	...	5	0	"	"	"
11	Kilowae	...	...	...	5	10	"	"	"
12	Mpemba	...	...	...	5	6	"	Upright	Rolled
13	Kichawachawa	...	...	...	5	0	Awned (purple)	Drooping	Medium
14	Hebu	...	...	...	5	7	" "	"	"
15	Komo Mango	...	...	...	4	9	Awned (white, pink tip)	"	"
16	Almeri Mgeni	...	...	...	4	0	Awnless	"	"
17	Bungala	...	...	...	5	8	"	"	"
18	Afa	...	...	...	5	6	"	Upright	Narrow, rolled
19	Sitima	...	...	...	5	8	"	Drooping	Medium
20	Kanunge	...	...	...	5	4	"	"	"
21	Maridadi	...	...	...	5	8	"	"	"
22	Msamaki	...	...	...	5	2	"	Upright	Narrow

The characters of the fruits were as follows :—

Number	Length	Breadth	Colour	During Growth		Pubescence
				Glumes	Tip	
	Mm.					
1	9	Narrow	Fawn	Brick	Purple	Slight
2	9	"	Straw	White	White	"
3	9	Thick	Purplish	"	Brick	"
4	10	Narrow	Brown spots	"	White	"
5	9	"	Light straw	Purple	Purple	"
6	8	"	Straw	White	Pink	"
7	8	"	Brown	"	White	"
8	9	"	Fawn	Purple	Purple	"
9	10	Very narrow	Light straw	White	Violet	"
10	9	Broad	Straw	"	Brick	"
11	9	Very narrow	Light straw	"	Purple	"
12	9	Narrow	Light brown	"	White	"
13	9	Broad	Dark straw	Purple	Purple	"
14	9	Narrow	Straw	Pink	Pink	"
15	9	"	"	White	White	"
16	10	Medium	Fawn	Purple	Purple	"
17	10	Narrow	Light brown	"	"	"
18	9	"	Dark straw	White	White	"
19	9	"	Light straw	Pink	Pink	"
20	10	Broad	Straw	White	White	Pronounced
21	8	"	Light straw	"	"	"
22	10	Very narrow	" "	"	"	"

The yields were as follows :—

Number	Name of Variety	Yield per 100 Plants		Yield per Plot	Yield per Acre
		Lb.	oz.	Kgs.	Kgs.
1	Africa	1	6	34	1,598
2	Marula	—	14	24	1,128
3	Ngowe	1	—	30	1,410
4	Meno Meupe	1	10	27·5	1,292·5
5	Kilimali	1	3	28	1,316
6	Jegerenati	1	4	29·5	1,386·5
7	Kimoto	—	3	8·5	399·5
8	Afiri	1	5	34	1,598
9	Unyengwa	—	9	21·5	1,010·5
10	Nwanga	—	12	22·5	1,057·5
11	Kilowae	—	11	19	893
12	Mpemba	—	12	21	987
13	Kichawachawa	1	1	25	1,175
14	Hebu	1	—	18	846
15	Komo Mango	1	1	30·5	1,433·5
16	Almeri Mgeni	—	15	27·5	1,292·5
17	Bungala	1	2	24·5	1,151·5
18	Afa	—	8	28	1,316
19	Sitima	1	2	33	1,551
20	Kanunge	1	2	34·5	1,621·5
21	Maridadi	1	1	39	1,833
22	Msamaki	—	7	23·5	1,104·5

Plots were sown on 5th January. The only outstanding points as regards maturity were the earliness of No. 9 (Unyengwa), 118 days, and the lateness of No. 18 (Afa) and No. 7 (Kimoto), 146 days, the others all being intermediate, 130 days. Intelligent native opinion gives the order of preference, by the valley inhabitants, as being Africa, Afiri and Maridadi; and Kanunge by the deltal natives (Numbers 1, 8, 21 and 20): and these, by this season's results, are the heaviest yielders. It is said that Unyengwa and Marula are old local types, and that the others have been introduced by Arabs and Indians.

88. *Maize Variety Trials*.—Hickory Horsetooth, Potchefstroom Pearl and White Congo varieties of maize were sown in triple-line plots in triplicate, on 2nd February, in section B at spacings of 3ft. by 18ins. With the heavy rains of March and April (317·8 and 296·7 mm. respectively) the area on which the experiment was being carried out became waterlogged and rain-water formed a standing pool. These conditions prevented significant results from being obtained as far as the number of days to flowering and harvest are concerned, but Hickory Horsetooth suffered less than Potchefstroom Pearl, which suffered less than White Congo, from these conditions, as may be expected from their qualities with reference to climate. The results are given below.

Variety	Number of Days to Flowers	Height at Flowering	Number of Days to Harvest	Percentage Stand	Comparative Yields
Hickory Horsetooth ...	56	7 ft. 6 in.	108	96·2	100
White Congo	55	6 ft. 2 in.	105	46·6	20·8
Potchefstroom Pearl ...	56	7 ft. 1 in.	108	59·7	32·3

The details of ten representative plants were :—

Variety				Total Length of Cobs	Total Weight of Cobs	Total Weight of Grain
					Lb	Lb.
Hickory Horsetooth	...	...	...	6 ft. 7 in.	4·5	4
White Congo	...	...	...	5 ft. 4½ in.	2·5	2·2
Potchefstroom Pearl	...	...	...	6 ft. 4 in.	4·1	3·5

89. *Bulrush Millet Variety Trials*.—Seven local varieties of bulrush millet (*Pennisetum typhoideum*) and one variety from Dodoma were sown in triple-line plots in duplicate at spacings of 3ft. by 18ins. for comparison. The trials were carried out in section A, and the plots were sown on 24th January. The results are given below :—

Plot Number	Variety	Comparative Yield	Number of Days from Sowing to Harvest
1	Dodoma	21.3 (VIII)	149
2	Lumbururu	57.9 (VII)	169
3	Kisago	100.0 (I)	"
4	Kukwili	71.2 (V)	"
5	Nyakihuki	77.5 (IV)	"
6	Ruhonyo	61.2 (VI)	"
7	Nyamatoti	80.8 (III)	"
8	Mkula	85.2 (II)	"

No signs of disease were observed.

90. *Simsim: Distance of Sowing Experiment*.—Seed of simsim, obtained locally, was sown in duplicate plots in section A, on 28th January. Results are given below :—

Plot Number	Spacing	Yields calculated per Acre
1	3 ft. 6 in.	Lb.
2	3 ft. 18 in.	136
3	Broadcast, or Native Fashion	184
		172

Different plants were found to have flowers of one of three different colours, (1) pink; (2) light blue; (3) dark blue.

91. *Cover Crops*.—*Centrosema pubescens* was tried for a third year. Even with the wet season experienced this crop was not sufficiently vigorous to overcome weed growth. *Passiflora foetida* proved a most effective cover crop, forming a close mat and smothering all weeds. Bonavist Bean again proved to be a most effective cover crop, killing all weeds except the strongest (such as the castor bean plant). It was sown at a spacing of 3ft. by 18ins. on 8th January, and remained green until the end of July, providing 186 kgs. of beans per acre. After the short rains of November and December, the plants took on a new lease of life, and the field very quickly became covered in the luxuriant growth of the bonavist plant, which provided a very heavy green manuring when the field was dug for the crop of 1928. Cowpeas (*Vigna Catjang*) and gram (*Phaseolus Mungo*) were not sufficiently vigorous to smother weeds, and should be regarded as catch crops rather than cover crops.

92. *Sowing of Seed for Increase*.—J Cotton (Selection Mp. 9) was sown over four acres for seed multiplication purposes in section A. It yielded but 100 kgs. of seed-cotton per acre, being considerably damaged by rats. It germinates very weakly.

M Cotton (Selection Mp. 12) was sown late over ten acres for seed multiplication in section A, when it became apparent that the native sowings of this selection were likely to be very much below what had been hoped for, and gave a yield of 52 kgs. per acre.

Cotton Selection Mp. 9/2 was sown in section B, and on an island in the river. Instructions for sowing were received late, and in section B, although the plots were watered, the plants did not grow. The small island plot yielded only 55 kgs. per acre.

Kenya Hybrid maize was sown for seed multiplication on 1.5 acres in section B, and yielded 931 kgs. per acre.

White Congo maize was sown on 6.6 acres in section A, and yielded 600 kgs. per acre.

The plots of Potchefstroom Pearl maize were destroyed by hippopotami, and the Natal 8-row maize by buffalo. Selected black seed of cowpeas were sown but were destroyed by floods.

Groundnuts sown for seed multiplication for distribution to natives of areas suited to this crop yielded only 88.8 kgs. per acre, the season being unfavourable to this crop, which is little suited to the valley lands.

Rice of the Unyengwa variety sown for multiplication at a spacing of 18ins. by 9ins. gave 1,230 kgs. per acre.

Pigeon peas, cowpeas and cassava were grown for food and for distribution to natives.

Dodoma bulrush millet, sown in section A for multiplication of seed for distribution to natives, gave a yield of 321kgs. per acre.

IBADAKULI AGRICULTURAL STATION.

93. This new station, which is side-by-side with the Native Council Farm, has an area of 200 acres, of which 100 were ploughed and cross-ploughed for a beginning. The principal trials are to be carried out with food-crops best suited to semi-arid conditions (select varieties of millets, maize and beans) and cotton and groundnuts. Work had been begun too recently for any results to be available for 1927; but that started for 1928 was already indicating that early planting is best for cotton and maize, as in other parts of the Territory.

BOTANIC GARDENS, DAR ES SALAAM.

94. Progress has been maintained in the gardens, and seed and plant exchanges have been very active. The introduction and distribution of plants and seeds is shown in the following summary:—

Introduction			Distribution				
Plants	Seeds	Cuttings	Plants	Seeds	Cuttings	Boxes of Seedlings	Suckers
48	Packets 98	4 bundles	1,116	Packets 84	2 bundles	10	800

In addition to the above, 35lbs. of seeds of *Calopogonium mucunoides*, and 9lbs. of *Crotalaria striata* (cever crops) were distributed.

95. Among the more interesting plants introduced may be mentioned the following:—

Pepper tree, *Schinus molle*, resistant to white ants.

Pisonia alba, avenue and shade tree.

Dalbergia Sissoo, timber tree.

Aleurites triloba, wood-oil tree.

Hydnocarpus anthelmintica and *H. Wightiana*, the oil from which is used in the treatment of leprosy.

96. The following is a summary of plant investigations, etc., carried out during the year.

97. *Fodder Plants*.—Algaroba, *Prosopis juliflora*. Of the seedlings grown from the seed originally received from Honolulu in 1923, ten plants were planted in Dar es Salaam, the whole of the remainder being sent to the Shinyanga District in 1924. Those planted in Dar es Salaam have made good growth, the conditions here apparently suiting the plants, the foliage carried being very heavy. All the seed is being collected as it ripens, and is being sent to the semi-arid regions of the Territory for establishing the plants there.

Bella Sombra, *Phytolacca dioica*.—Seeds germinated well in the nursery beds, and the seedlings developed strongly with nursery care. The plants were put out in their permanent positions during the big rains, but are now in extremely poor condition, and are not worth persevering with as a fodder crop suited to conditions in Dar es Salaam.

Amalegea, *Crotalaria striata*.—A small packet of this seed was sent by the District Agricultural Officer, Mwanza, who, in a report on Ukara Island, Lake Victoria Nyanza, states that as there is no grazing on the island, the cattle there are stall-fed with this plant. The plants from the seed grew well, and herbarium specimens were sent to Kew for identification, where it was determined as above. The Director in his letter expresses surprise that this plant is used for feeding stock, and further states that it is poisonous to cattle. A further report has been asked for from the District Agricultural Officer, Mwanza, and feeding trials are to be carried out this season.

Kurrajong, *Sterculia diversifolia*.—Seed was received from New South Wales and germinated well, but subsequent growth is slow. Seedlings have been sent to the Shinyanga District and other suitable areas.

Atriplex semibaccatum, *A. nummularium* and *A. leptocarpum*.—A few seeds were retained here for trial and germinated well. Subsequent growth was good, but the hot dry season killed most of the plants, and only four plants of *A. nummularium* now survive.

Berseem, *Trifolium alexandrinum*.—Seed was received from Egypt. Germination was poor and irregular, and the seedlings died off.

Kikuyu grass, *Pennisetum clandestinum*.—Root cuttings were received from the Kilimanjaro area, and planted in nursery beds for further propagation. This grass will not survive under conditions in Dar es Salaam without frequent waterings in the dry season.

Stenotaphrum complanatum from Mauritius has done exceptionally well under the shade of Saman (*Enterolobium Saman*) trees. The grass is easily propagated by division, and a further planting has been made under the dense shade of a tree of *Ficus Volkensii*. Plots of indigenous fodder grasses were planted, and of these *Panicum trichocladum* is the most promising. This grass is usually found in damp places under shade, and will climb where supports are available. Planted for observation on how it would grow in full sun, it was slow in establishing itself, but later made complete cover. Part of the plot was manured, and a very luxuriant growth resulted, indicating that with good soil and manuring a very heavy crop of green fodder or hay would be obtained. The remainder of the plot which received no manure is in good condition, but the growth is not nearly so heavy as when the grass is planted under light shade or on manured ground.

98. *Fibre Plants*.—Sunn hemp, *Crotalaria juncea*.—This plant was grown for trial in comparison with other fibre plants. Normally this plant grows to a height of 6ft. to 10ft., but 5ft. was the maximum to which any of the plants attained here. Stems were pulled, stripped of their leaves, dried slightly, bundled, and then retted for eight days. The fibre obtained was extremely poor and disappointing, and was not worth submitting for a technical report. Further trials are being made.

Roselle, *Hibiscus Sabdariffa* var. *altissima*.—Seeds of the green and red types of this plant were received from Java in 1926, and sown on 3rd March, 1927; the plants began to flower early in June. They are stated to reach a height of 10ft. to 12ft. or more, but 6ft. to 7ft. was the maximum to which the plants grew here. Stems were pulled and retted at different stages of growth, and the fibre submitted to the Imperial Institute for examination and report.

Deccan hemp, *Hibiscus cannabinus*.—The work with this had to be begun again as the plots were destroyed for building purposes. A small quantity of seed of indigenous plants was collected locally and sown in March. The plants had begun to flower early in June, and stems were pulled and retted at different stages of growth, and the fibre submitted to the Imperial Institute for examination and report.

A favourable report has recently been received from the Imperial Institute on the fibres mentioned above from *Hibiscus Sabdariffa* var. *altissima* and *Hibiscus cannabinus*.

99. *Other Plants: Vigna marima*. This plant made excellent growth, but the setting of seed was extremely disappointing, only about 1lb. of seeds (the whole amount) being collected from about thirty plants.

A trial of a method of obtaining quicker and more certain germination of oil palm (*Elaeis guineensis*) by soaking the fruits, with the oily covering removed, in fresh water changed daily for five days before sowing them, was successful, the comparatively high germination of 87 per cent. having been obtained.

100. *General Matters*.—Inspection of coconut plantations in and near Dar es Salaam has been maintained, and general improvement of their condition continues, under the direct supervision of the Head Gardener.

The first-order meteorological station at Dar es Salaam has been fully maintained, the Head Gardener being the observer.

The Head Gardener acts as Plant Import Inspector at Dar es Salaam, and 101 consignments were examined, 20 being refused entry and 7 treated before importation.

All museum exhibits have been classified, labelled and indexed, and a number of herbarium specimens classified.

101. Among other duties carried out by the Head Gardener were the important executive work for the exchange of planting material with other countries; the packing of plants and seeds, including the exhibits sent from Dar es Salaam for the Nairobi Agricultural Show (*see* paragraph 48); the management of the Ruvu native vegetable-growing scheme; conducting cotton auctions at Dar es Salaam; and the care of cemeteries

102. The total number of different kinds of plants introduced by the Department from other countries was 143, comprised of food-crops 67, other economic plants, 29, and decorative 47.

YIELD OF CROPS.

103. Appendix II shows the yield in 1927 from measured areas of crops raised in the ordinary way in native fields. These figures are given in the Report from year to year because little is generally known or recorded in the tropics regarding this important matter.

PROGRESS OF THE CHIEF EXPORT CROPS.

104. The general progress is shown in the following table, which has already had reference in paragraph 48. The remainder of the section gives the progress of the crops in the different areas where they are chiefly produced.

TANGANYIKA TERRITORY.—PRINCIPAL EXPORTS, 1913 AND 1923-27.

EXPORT	1913				1923				1924			
	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order
Sisal...	416,680	535,580	30.1	I	256,900	367,228	22.2	I	368,560	644,835	24.7	I
Hides and Skins	69,120	274,511	15.4	III	41,370	117,554	7.1	VI	50,948	185,843	7.1	V
Cotton	43,840	120,753	6.7	IV	29,386	177,710	10.7	IV	50,828	373,753	14.3	II
Copra	109,540	117,401	6.6	V	133,380	131,536	7.9	V	162,500	178,194	6.8	VI
Groundnuts...	179,220	95,932	5.3	VI	330,160	204,129	15.9	II	373,680	359,918	13.8	III
Beeswax	11,180	70,743	4.0	VII	6,039	24,758	1.5	X	8,497	44,666	1.7	X
Coffee	21,180	46,563	2.6	VIII	80,937	204,987	12.4	III	105,222	352,529	13.5	IV
Simsim	29,520	20,407	1.1	XI	85,100	75,527	1.6	VII	78,180	80,324	3.1	VII
Rice...	15,420	8,717	0.5	—	57,721	41,517	2.5	VIII	62,235	59,866	2.3	VIII
Millet	18,210	5,498	0.3	—	121,973	36,095	2.2	IX	158,332	49,976	1.9	IX
Total	913,910	1,296,105	72.6	—	1,146,566	1,441,041	87.0	—	1,418,982	2,329,904	89.2	—
Plantation Rubber	25,740	309,195	17.5	II	—	—	—	—	—	—	—	—
Ghee	6,656	15,400	0.8	X	—	—	—	—	—	—	—	—
Cotton Seed	—	—	—	—	—	—	—	—	—	—	—	—

EXPORT	1925				1926				1927			
	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order
Sisal...	365,520	688,451	22.9	I	500,400	911,293	29.1	I	660,240	1,160,735	33.7	I
Hides and Skins	53,225	240,165	8.0	IV	41,907	164,435	5.3	V	55,802	238,890	7.0	IV
Cotton	90,043	540,481	18.0	II	97,723	427,437	13.7	III	78,814	361,916	10.5	III
Copra	152,460	160,800	5.3	VI	146,960	152,228	4.9	VI	145,340	143,024	4.2	VI
Groundnuts	181,100	178,085	5.9	V	317,340	254,903	8.1	IV	282,940	238,082	6.9	V
Beeswax	5,858	42,755	1.4	X	6,147	48,179	1.5	IX	11,169	80,863	2.4	VII
Coffee	120,186	481,055	16.0	III	130,793	495,199	15.8	II	131,899	463,420	13.5	II
Simsim	67,920	71,561	2.4	VII	71,260	68,585	2.2	VII	74,660	74,017	2.2	VIII
Rice...	60,921	62,232	2.1	VIII	65,295	57,564	1.8	VIII	78,820	72,253	2.1	IX
Millet	66,531	25,517	0.8	—	58,126	24,094	0.8	—	72,268	29,164	0.9	X
Total	1,163,764	2,491,702	82.8	—	1,435,951	2,603,917	83.2	—	1,591,952	2,862,364	83.4	—
Plantation Rubber	7,520	49,794	1.6	IX	7,151	41,310	1.3	X	1,738	7,065	0.2	—
Ghee	7,658	33,770	1.1	—	7,428	32,577	1.0	—	7,912	30,015	0.9	X
Cotton Seed	86,980	32,560	1.1	—	105,900	22,185	0.7	—	91,320	18,440	0.5	—

The respective values of the native and non-native exports given above for the year 1927 are as follows :—

Export	Native	Non-Native
	£	£
Sisal	—	1,160,735
Hides and Skins	238,890	—
Cotton	269,708	92,208
Copra	103,024	40,000
Groundnuts	238,082	—
Beeswax	80,863	—
Coffee	252,040	211,380
Simsim... ..	74,017	—
Rice	72,253	—
Millet	29,164	—
Ghee	30,015	—
Total ...	£1,388,056	£1,504,323

COTTON.

105. The output of lint from ginneries in the season 1927-28 was as follows :—

COTTON LINT PRODUCTION.

Province	In Lb.				Difference per Cent.	
	1924	1925	1926	1927	1926	1927
Eastern... ..	3,875,803	3,054,171	5,442,152	2,839,710	+ 78	— 49
Tabora	175,894	365,022	615,350	410,892	+ 70	— 33
Mwanza	2,128,694	3,510,689	2,687,650	2,648,995	— 24	— 10
Lindi	553,228	855,178	559,573	340,620	— 35	— 39
Tanga	326,472	603,350	140,082	52,239	— 77	— 63
Northern	409,761	267,814	264,662	93,999	— 1	— 68
Mahenge	6,483	10,782	...	...	...	...
Bukoba	40,429	8,546	2,819	...	— 74	..
Iringa	600	14,128	...	...	...	...
Total ...	7,517,364	8,689,680	9,712,288	6,386,455	+ 12	— 34

106. The effect of the low prices of 1926 in causing the considerable decrease of production, mentioned already, took place to the least extent in Mwanza where cotton-growing appears to be best suited to the genius of the people for inclusion in their normal agriculture whatever the conditions. That an unfavourable market has a much greater effect on non-native than on native cotton is shown by the following figures of pounds of lint ginned for non-natives in the two last seasons :—

Province	1926	1927
Eastern	2,684,718	1,539,349
Lindi	77,832	50,486
Tanga	43,080	...
Northern	207,985	37,261
Total	3,013,615	1,627,096

107. The table given on the next page shows the details of progress of cotton production by natives.

PRODUCTION OF COTTON BY NATIVES. IN POUNDS.

Province	1924	1925	1926	1927	Difference	Percentage of Total Production in Province		Percentage of Total Native Production	
						1926	1927	1926	1927
Eastern ...	2,159,471	1,690,307	2,757,434	1,300,361	Per Cent. - 53	50	46	41.2	27.4
Tabora ...	159,930	349,622	615,350	410,892	- 33	100	100	9.2	8.6
Mwanza...	1,711,292	3,410,659	2,687,650	2,648,995	- 1	100	100	40.1	55.5
Lindi ...	492,802	737,538	481,741	290,134	- 4	86	85	7.2	6.2
Tanga ...	102,963	204,914	97,002	52,239	- 46	70	100	1.4	1.1
Northern	67,904	31,250	56,677	56,738	—	21	60	0.9	1.2
Mahenge...	4,980	10,782	—	—	—	—	—	—	—
Bukoba ...	14,468	7,880	2,819	—	—	100	—	0.0	—
Iringa ...	600	14,128	—	—	—	—	—	—	—
Total ...	4,714,410	6,457,080	6,698,673	4,759,359	- 29	—	—	—	—

Percentage of total production of the Territory :—1924, 62.7 ; 1925, 74.3 ; 1926, 67.9 ; 1927, 74.0.

SISAL.

108. The north-eastern districts, chiefly Tanga, continue to be responsible for the greater part of the continued increase of output of this product : 69 and 73 per cent. in 1926 and 1927, with 17,384 and 24,185 tons, respectively. Lindi showed an important increase, from 1,816 to 2,599 tons; whilst production in Morogoro and Dar es Salaam decreased from 5,822 to 5,697 tons, largely because more attention is being given to new plantings. Increased planting of sisal continues in Moshi District, especially in Arusha Chini, also in Rufiji District, and planting has just begun in the Kigoma Province.

COFFEE.

109. In the Northern Province, on the slopes of Kilimanjaro and Meru and the Usambara Mountains, production increased by nearly 40 per cent. : from 37,716 cwts. to 52,281, 8,001 cwts. of the latter production being native. The export of native coffee from Bukoba fell to 78,879 cwts., or 60 per cent. of the total for the Territory, from 92,994 cwts. in 1926, and almost neutralised the increase from the Northern Province. The total export of non-native coffee in 1927 was 45,019 cwts., and of native coffee the amount was 86,880 cwts., worth £211,380 and £252,040, respectively.

GROUNDNUTS.

110. The export from the chief producing areas, Mwanza and Northern Tabora, was 9,188 tons in 1927, as compared with 10,120 in 1926 and 4,558 in 1925. Of the first-mentioned amount, 4,876 tons were exported by the new railway from stations in Northern Tabora (chiefly Bukene and Shinyanga with 3,696 tons). The export from the producing area next in importance, the Central Province and Southern Tabora, was about 4,500 tons; and from the rest of the Territory (chiefly Lindi, 346 tons) about 450 tons.

COPRA.

111. The northern areas (Tanga and Pangani) continue to produce more than any other part of the coast or Mafia Island, their export being 37 per cent. of the whole, namely, 2,719 tons, or 6 tons less than in 1926; Mafia shipped 1,410 tons, or 177 less than in that year. Dar es Salaam and Bagamoyo were the other chief producers, with 1,442 and 1,150 tons; whilst the total export from Kilwa and Lindi Districts was only 546 tons.

SIMSIM.

112. The export from Lindi District, 51 per cent. of the whole, was 1,904 tons, or 237 more than in 1926. Of the other areas exporting simsim, Mwanza, Kilwa and Morogoro, the first two shipped 794 and 442 tons.

GRAIN.

113. The export of rice, millets, maize and pulse, in that order of importance for export, comprise grain. Rice has its chief source in Mwanza, from which Province 3,916 tons, or 99 per cent. of the total export, went to Uganda and Kenya. The proportion of millets that reaches export comes chiefly from Lindi, which shipped 1,451 tons, or 40 per cent. of the total export : a shipment that was greatly reduced from that of the former year, 2,242 tons, through low prices, causing a glut in the bazaar. Maize was shipped chiefly from Tanga (15,157 cwts.) and Lindi (3,254 cwts.), the shipments from Tanga Province being 57 per cent. of the total shipments : an entirely new export that has had its rise chiefly through the response to agricultural advice of natives in that Province.

BEESWAX.

114. Owing mainly to the good prices mentioned already, the export of the Territory was nearly doubled, Morogoro, Dodoma and Tabora producing 9,821 cwts., which was more than one-half as much again as the total shipments in 1926, and 88 per cent. of the whole export in 1927. Of the other areas, Mwanza increased its export from 183 to 454 cwts.; but Lindi and Kilwa did not maintain their increase from 1925, dropping from 1,921 to 855 and 157 to 13 cwts., respectively. Of the exports from Lindi District, 244 cwts. came from Songea.

CHILLIES.

115. The production of 18,198 cwts. in 1924 shows that with a fair and steady market this would be an export of use for native welfare; but low prices have brought shipments to merely 138 cwts. in 1927, and higher prices do not lead to encouragement of production, only to meet the conditions of a returning poor market when the crop is ready to be sold.

GUMS.

116. Mwanza and Northern Tabora have the largest share in an export of gum arabic that reached 6,681 cwts. from 4,589 cwts. in 1926. By far the greatest quantity of gum animi (copal) comes from Bagamoyo and Kilwa: these two areas exporting 2,101 and 1,119 cwts., Lindi and Rufiji following with 198 and 129 cwts., respectively.

BARK.

117. Another forest product is mangrove bark, which accounted for most of the 166,601 cwts., worth £30,518, of bark for tanning that was exported. The quantity of this that is shipped has increased by nearly 260 times since the export of 643 cwts. in 1923.

RUBBER.

118. The exports of plantation rubber (Ceara) and wild rubber have quickly decreased with the fall of prices: 7,152 and 1,103 cwts., respectively in 1926, to 1,755 and 800 cwts. in 1927.

RAW SUGAR.

119. The export continues to decrease: 35, 33 and 16 tons, in the last respective three years, chiefly from Pangani. On the other hand, syrup (molasses) increased from 9 tons in 1926 to 28.

CONTROL OF PLANT PESTS AND DISEASES.

PESTS OF PLANTS.

120. The following is taken from the report of the Entomologist for 1927-28.

121. The reference collection comprises 1,485 species of insects, identified by the Imperial Bureau of Entomology.

122. *Silk Production*.—The Silk Advisory Committee of the Imperial Institute reported that samples of silk cocoons raised at Morogoro in 1926 from four races of worms (Chinese, Japanese and crosses of Chinese and Japanese with Italian) constituted the most promising first parcel of cocoons from a new country so far examined by the Committee; and, subsequently, a reeling trial confirmed this opinion. As a result of discussions between the Committee and the Entomologist, eggs of French and French crossed with Chinese races were sent in March, 1928, for continuing the work. For trial for suitability and feeding, mulberry from French seed and the kind *Morus alba*, var. *italica*, are being grown at the Morogoro Agricultural Station;

whilst *M. indica*, planted for hedges before the war, appears to thrive wherever it has been observed in the Territory. Distribution of mulberry seed has been widely made to planters and schools; the growing of mulberry as a hedge round farms and coffee plantations is encouraged; and instructions for mulberry-growing have been issued. It is of interest that a planter in Morogoro was planning to grow mulberry on a large scale and to erect a filature.

123. Regarding wild silk, there has been no revival of the German activity with *Anaphe panda* in Bukoba. The commercial possibilities of *Anaphe* silk have been discussed with the Silk Advisory Committee and two silk firms; and in the present conditions of their uncertainty, attempts to introduce mulberry silk production among natives are considered to be preferable.

124. *Wax Production*.—The increase of this has been dealt with in another part of the Report. Propaganda for the adoption of hives using the queen excluder has been continued, but for this the cylindrical double-chamber Sudan hive of woven material has been replaced by a bark hive with a similar means for exclusion, namely, a nine-inch disc of standard zinc excluder. The use of bark is well-known to natives generally throughout the Territory for the making of grain storage bins, whereas the style of weaving of the original hive of Sudan pattern is one known only to tribes who have come under Nubian influence; moreover, bark is more durable under the climatic conditions of Central Africa than woven straw. An illustrated leaflet describing the bark hive is being prepared.

125. The following varieties of honey bee have been determined:—

Apis mellifera, L., subsp. *unicolor* Latr.

„ „ *unicolor*, var. *intermissa*, But-Riep.

„ „ „ var. *adansoni*, Latr.

The variety *intermissa* had been successfully domesticated in frame hives on Kilimanjaro. The domestication of African bees, which is being tried, has, however, been found very difficult, and requires to be carefully studied; for African bees are very averse to being handled.

126. *Insects of Grain and Storage*.—Observations made on crops in 1926 and 1927 have demonstrated the immunity of black gram, *Phaseolus radiatus*, to the common bean weevil of the Territory, *Bruchus chinensis*, Thunb., and to bruchids generally. Indian commercial stock of black gram and stock supplied by the Bombay Department of Agriculture have proved resistant to the pest. Another advantage of this gram is that its hairy leaves and stems afford effective protection against the Chrysomelid beetle, *Ootheca bennigseni*, Wse., an extremely severe legume pest occurring during the rains, when effective dusting with arsenical poisons is almost impossible.

127. The hard-grained sorghums of the Territory such as Karachi (Central and Coastal Areas) and Mwilu (Tabora) can be kept indefinitely in storage when bagged pure. The unsatisfactory quality and appearance of stored stocks, e.g., of Dodoma grain, arises from admixture with soft varieties and lowers prices. Our hard-grained sorghums take from 160 to 200 days to come to maturity, and are thus exposed for an unduly long period to attack by the stem borer, *Diatraea argyrolepida*, Hmps., and selection for quicker maturity is now being given consideration. The bulrush millet of the Territory, *Pennisetum typhoideum*, an excellent insect-resistant grain, still leaves much to be desired in the matter of cleaning from chaff; hence imports from India are preferred in such markets as Zanzibar. In addition, the chaff prevents ventilation of the grain in storage, causing mustiness, which encourages *Tribolium* spp. and the cotton-seed worm, *Corcyra cephalonica*, Stn.

128. *Panicum miliaceum* and *P. frumentaceum*, introduced for trial from Surat in grain storage experiments, have yielded grain of excellent keeping qualities. Like bulrush millet they require some form of mechanical cleaning (possibly a leather thong roller as for rice-cleaning) for commercial

storage and export. In the field the *Panicums* are severely attacked by the stem maggot, *Atherigona* sp., a circumstance against their use in short or doubtful rain periods. With the food-crops, selected or introduced, being distributed from Agricultural Stations—sorghums, millets, black gram, Madagascar beans, etc.—it is considered that the Territory has available a selection of famine (or long-storage period) foods likely to prove highly resistant to insects. As has been indicated, however, there is room for improvement in their field behaviour (time of maturity, characters of stem and panicle, etc.) from considerations of field-pest control.

129. *Pests of Coffee*.—The identity and behaviour of the mealybugs occurring on coffee has been carefully studied, and the following species have been recorded :—

- (1) *Pseudococcus brevipes*, Ckll., Mwanza :—On under side of foliage of arabica on lake foreshore; infestation of medium intensity.
- (2) *Pseudococcus bukobensis*, sp. nov. Laing (ms.), Bukoba :—Associated with lilacinus on underside of foliage of arabica on lake foreshore.
- (3) *Pseudococcus filamentosus*, Ckll., Arusha :—Recorded from two plantations of arabica; occurs along primary branches and in cherry clusters; rare.
- (4) *Pseudococcus lilacinus*, Ckll., Bukoba :—Attacking arabica, robusta and liberica, but in no observed instance was infestation intense; accompanied by sooty mould.
- (5) *Pseudococcus perniciosus*, Newst. and Willc., Arusha, Moshi :—Recorded from two plantations on arabica; location as for *filamentosus*; rare.
- (6) *Ferrisia virgatus*, Ckll., Arusha, Moshi :—Recorded from three plantations on arabica; on under surface of foliage and in cherry clusters, and accompanied at times with intense sooty mould.

The alternative hosts of the coffee mealybugs are as follows :—

- (1) *Pseudococcus brevipes* :—Roots of pigeon pea and various palms.
- (2) *Pseudococcus lilacinus* :—On under surface of leaves of crotons.
- (3) *Ferrisia virgatus* :—On foliage of ylang ylang; *Ipomoea coccinea*, sweetsop, soursop, *Acalypha* spp., cassava, and cotton.

130. The yellow fringed scale (*Asterolecanium coffeae*, Newstd.) has been observed severely attacking coffee up to five years of age in certain sections of the Bukoba region; but not in the northern coffee areas. The only remedy in severe infestations is uprooting and burning.

131. Arising out of the survey in 1926 of the Bukoba coffee area, the following scale insects are recorded from coffee in addition to those detailed in the Entomological Report for 1925-26.

- (1) *Aspidiotus lataniae*, Sign :—On stems and branches associated with *Asterolecanium*; mild.
- (2) *Ceroplastes vinsonioides*, Newst. :—Along midrib of upper surface of leaf, 50 to 60 per leaf; Kamaschuma District; medium severity.
- (3) *Chionaspis ritchiei* sp. nov. Laing (MS.) :—Marginally on under surface of foliage and encrusting coffee cherry; medium severity.
- (4) *Coccus caudatus*, Green :—Arranged marginally on under surface of leaves, 20 or more per leaf; accompanied by sooty mould; Kashasha District; medium severity.
- (5) *Ctenochiton arborescens*, Laing :—Under surface of foliage; not widely distributed; mild.
- (6) *Icerya aegyptiaca*, Doug. :—On under side of foliage along mid-rib; mild.

- (7) *Ichnaspis longirostris*, Sign.:—Encrusts main stems and branch systems, extending to coffee cherry and leaves; usually under-surface; severe.
- (8) *Lecanium* sp. nov.(?), T.T. No. 468 :—Severely infesting stems and branches in Bonguma and Rubungo Districts, accompanied by sooty mould.
- (9) *Pseudaonidia trilobitiformis*, Green :—Mild; along midrib on upper surface of foliage.
- (10) *Pulvinaria psidii*, Mask :—Upper surface of foliage; mild; not widely distributed.
- (11) *Selanaspidus articulatus*, Morg. :—Severe, causing etiolation and crumpling of leaves; 50 to 100 per leaf; upper surface principally involved, but both in cases; Kashasha District.

One marked feature in Bukoba was the greater susceptibility of *C. arabica* to coccid attack, compared with *C. robusta*. The latter showed attack only of *Ceroplastes cereferus*, And., *Lecanium viride*, Green. and *Pseudococcus lilacinus*, Ckll. Another notable feature in an area with coccids generally so numerous was the extreme dearth of predatory or parasitic enemies. One species only of predatory coccinellid, *Chilocorus discoideus*, Crotch. was recorded. Caterpillars of the predatory Lycaenid, *Eublemma costimacula*, Saalm., were present wherever *L. viride* was numerous. Introduction of coccid predators to the Bukoba area is contemplated as a line of work which should prove highly beneficial.

132. The two leaf-eating Eumolpid beetles, *Macrocoma aurivillosa*, Marsh. and *Colasposoma coffeae*, Kolbe. have proved troublesome in the Northern Area on newly set-out coffee in the wetter months of the year when protection by means of arsenical poisons is difficult. The worst pest of the kind on bearing coffee is the Hispid, *Dactilispa* sp. near *litigiosa*, Per. which on occasion appears in great numbers (July) and furrows out the upper epidermis of the coffee in a somewhat characteristic fashion. Coffee where the beetle has not been controlled by sprays of arsenate of lead presents a fire-blighted appearance, followed by heavy fall of leaf. The coffee aphid of the territory is *Toxoptera aurantii*, Boyer., which has not yet been observed or reported as severe.

133. Coffee leaf-curl has only been observed in Bukoba and is confined to *C. arabica*; it is caused by *Hoplandothrips coffeæ*, sp. nov. Begenal (MS.), which occurs within the curled leaf in considerable numbers. A thrips of systematic interest also occurs in the Hoplandothrips colonies, *Mymarothrips ritchianus*, gen. et sp. nov., Begenal (see *Annals and Magazine of Nat. Hist.*, Ser. 10, Vol. I, p. 304, Febry. 1928), but its economic relationship with the Mymarothrips is not yet decided. *Physothrips xanthoceros*, Hood., the common thrips of the northern coffee districts, was also collected in Bukoba, but the higher humidity and uninterrupted growth of the coffee maintain conditions unfavourable to destructive uprisings of this formidable pest. The red thrips, *Retithrips aegyptiacus*, March., was generally prevalent in the Province; but as far as observed, of doubtful economic importance. The Capsid bug, *Lycidocoris mimeticus*, R. and P., causes considerable damage called bug withertip to young growth of *C. arabica* in the Bukoba district in July and August, by puncturing the growing tips and the young foliage causing death.

134. Among stem borers the yellow-head borer, *Dirphya princeps*, Jordan, is observed to be peculiar to the Bukoba coffee area, just as its congener *D. usambica*, Kolbe, has been seen to be peculiar to the Usambara coffee area. Its grubs typically begin attack on the primary branch system and thence work down to the main stem. The organizing of protection of the Bukoba coffee industry now rendered possible by increase of staff, and reconditioning of coffee fields, will do much to rectify the low vitality of coffee so conducive to attack by *Dirphya*. The large shothole borer, *Apate monachus*, F., and the white coffee borer, *Anthores leuconotus*, Pasc., are not localised like the *Dirphyas*, but general.

135. As regards cherry maggots it has heretofore been considered that the presence of maggots in the cherry of coffee, a crop in which the seed, not the fruit, is marketed, was in no way detrimental to the coffee. In certain seasons and in certain coffee areas in the Bukoba district the feeding of the maggots in the cherry induces a secondary rot in the cherry, which invades the stalk causing dropping of the cherry. Samples from cherry caused to fall in this way, examined in Bukoba, gave up to 88 per cent. of first class bean. The control measure against *Antestia* (poison syrup) is also applicable to Trypetid flies, so that treatment for one reduces the bad effects of both. The maggot infests cherry of *C. arabica* much more than that of *C. robusta*, apparently because of the greater fleshiness of the former. The species of Trypetidae occurring in cherry are: *Trirhithrum nigerrimum*, Bezzi, var. *coffea*, Bezzi, *Pterandrus rosa*, Karsch, and *Ceratitis capitata*, Wied. All three may occur together, but while the first and second series are the observed major pests, the *Pterandrus* in Arusha district and the *Trirhithrum* in the Central area, the *Ceratitis* is never numerous, a condition which applies generally to the behaviour of *Ceratitis* in the Territory on other fruit hosts, its place as a major pest being invariably taken by *Pterandrus*.

136. The greatly important coffee bean borer, *Stephanoderes hampei*, Ferr., is native to Central Africa and, until its recent discovery in the Kyambu district of Kenya Colony, was not known to occur east of the Great Lakes. This discovery gives a strong reason for planters in the Northern and Usambara areas, where *Stephanoderes* does not occur, to rely upon a domestic seed supply for coffee. *Stephanoderes* has been carried, doubtless in seed, to Java about 1909 and to Brazil about 1918, and its destructive behaviour in these two new coffee countries has gained for it a considerable and merited infamous notoriety. It is noteworthy that the agricultural authorities of the Dutch East Indies have transported certain of the hymenopterous parasites of *Stephanoderes* with highly beneficial results from Uganda to Java and Sumatra. Bukoba Province is the only part of Territory lying west of the Great Lakes and within the region of natural distribution of *Stephanoderes*, and here exists a coffee industry the annual production of which has grown from 403 tons in 1913 to 3,944 in 1927. Examination of Bukoba coffees in the field has shown that the major depreciation attributable to insect attack arises not from the *Stephanoderes* but from the coffee bug *Antestia lineaticollis*, St. (det. China.). Pulped coffees showed from 24 to 36 per cent. of "floats" or "lights." Of the floats, 73 per cent. were found to be unmarketable through *Antestia* and 4 through the bean borer, the remainder being low grade; this corresponds to a percentage of 28 unmarketable in the whole sample. Of the residue after separation of the floats 5 to 7 per cent. (two samples) was unmarketable through these insects. Field inspection indicated a strict soundness of bean of 60 to 70 per cent. Commercial samples in the hands of Arab and Indian traders were found to contain 5 to 13 per cent. of bean strictly unmarketable through these pests. It is hoped to correct the conditions that are thus indicated by means of the powers to be conferred through the Coffee Industry (Registration and Improvement) Ordinance, 1928, combined with work in the field against *Antestia* and *Stephanoderes* for which the hands of officers of the Department of Agriculture will have been strengthened by the Plant Pest and Disease (Coffee) Regulations, 1928. Work against *Stephanoderes* in the Bukoba Province has been initially directed along the following lines: picking mature cherry without delay; intensive collection of all dried cherry from trees; intensive collection of all fallen cherry; and immediate burning of all hullings and rejected coffee bean.

137. In order to simplify and facilitate the work of control of the formidable coffee bug, *Antestia*, arrangements were made by the Entomologist whilst on leave for importing arsenite of soda used in the preparation of the sweetened poison-spray against *Antestia* (see para. 17, Report 1925-26) in lead-foil packages of twenty grammes, the requisite amount of poison for a paraffin tinful of the mixture. Even when the arsenite is put up in this convenient form, the total cost of materials (arsenite and native sugar) is

only Sh. 1/- for 1,000 coffee trees. Labour gangs provided with cheap hand-syringes (costing Shs. 2/50 to Shs. 3/- when bought in quantities in England) and tinfuls of the sweetened spray can treat large areas of coffee quickly and well. There is no doubt that Arabian coffee is more attractive to *Antestia* than *robusta*: so much so that in a mixed plantation the former will be attacked, but not the latter (except in a serious epidemic), the attraction being the more fleshy cherry of the Arabian.

138. *Cotton Pests*.—The scales, *Pulvinaria jacksoni*, Newst., and *Ferrisia virgatus*, Ckll., were collected from cotton in the Nzega District of Tabora; but in no instance was either pest common or the infestation severe. *Phenacoccus iceryoides*, Green, occurred, severely infesting cotton north of Dar es Salaam, and there were a few isolated infestations of *Saissetia nigra*, Neitn., on non-native cotton at Kimamba. The following parasites of cotton insects reared at the Laboratory have now been determined by the specialists:—

Chelonus curvimaculatus, Cam. from *Platyedra*

Microbracon kirkpatricki, Wilk. *gossypiella*,

Brachymeria olethrius, Waterst. Saund.

Microbracon rebessus, Szep., from *Sylepta derogata*, F.

Bassus aciculatus sp. nov. Brues (MS.), from *Earias* sp. A wild host of the cotton stem and bell weevil.

Apion xanthostylum, Wagn., is not yet known. An apion breeding freely in the seed capsules of wild Malvaceae has been identified as *Apion pauli*, Fst.

139. *Destruction of Vermin*.—An opportunity will be taken for trial of cyanogas dust against the sisal root rat, *Rhizomys splendens*, when it offers favourably. Rat poison has been imported in press-top tins containing 4oz. for distribution in cases of destruction by rodents of crops in field and in store. White arsenic and barium carbonate have also been issued in bulk to field officers. On the general question of control of farm vermin (inclusive of pig, monkey, porcupine and rat), it must be emphasised that the excessive and widespread destruction of crops now prevalent throughout the areas of intensive native agriculture has become such as to warrant a special investigation of the problem, and the appointment of such staff for direction and organisation of work of control of vermin as the investigation may indicate as necessary.

140. *Exclusion of Pests and Diseases*.—Two important pests not as yet established in the Territory were intercepted during the period under review. These were: *Pseudococcus citri*, Risso., on citrus from South Africa, and *Aspidiotus hartii*, Ckll., on ginger rhizomes from Travancore, India. The following is a complete list of plants that have been placed on Schedule I of the Plant Pest and Disease (Import) Regulations for the prohibited entry of seed without permit:—

Coffee (for sowing).

Cotton.

Tobacco.

Tea from India, Formosa and Japan.

Para rubber from South America, Central America and the West Indies.

Cocoa from South America and West Africa.

Coconut from South America, Central America and the Lesser Antilles.

Groundnut from India.

Whilst the second Schedule, of plants whose entry is prohibited unless they can be inspected and treated as requisite, includes:—

Coffee plants whether living or dead.

The plants of any stone fruit, or any portion thereof.

Apple and pear stocks.

Seed potatoes.

Citrus plants or fruit (except citrus fruit grown in Zanzibar or Pemba).

Sugar-cane cuttings.

All palms.

DISEASES OF PLANTS.

141. The following is the Report of the Mycologist for 1927-28.

142. During the year 1927-28 the post of Mycologist was established, with a laboratory at Morogoro. Preliminary field surveys of diseases of coffee, sisal, cotton and coconuts have been made, the parasites of which and of other crops are noted below. A complete single list of fungi recorded from the Territory during the past twenty-five years is in course of preparation, to facilitate future diagnosis.

143. *Diseases of Coffee*.—Plantations of coffee were examined in the Northern Province between March and July of 1927. Above an elevation of 4,000ft., coffee trees were flourishing and showed little disease; but below that elevation several diseases, particularly of the leaves, were widespread. Rust (*Hemileia vastatrix*), brown blight (*Colletotrichum coffeanum*), and brown-eye spot (*Cercospora coffeicola*) were the most common. Plantations vary greatly in the amount of rust they exhibit: Arabian coffee is much more liable to attack than robusta, but Kent's variety of the former shows a marked resistance. Altitude, humidity, shade and vigour of the trees have, in varying degrees, great importance in infection, effect and spread of the rust; and in combination these factors have varying relative effect. Methods of control have been suggested where possible. Brown blight is a frequent sequel to rust and insect injury, but occurs also as a primary disease, hastening the death and fall of the leaves. Brown-eye spot is essentially a seedling disease, but has been observed on trees up to four years old. A damping-off disease was also found under excessively moist conditions. A species of *Capnodium* was found on plants parasitised by aphids and scale insects. Die-back has been observed in twigs of Arabian coffee, due to the brown blight fungus, and in twigs and branches of robusta, due to an association of twig-boring beetles and the same fungus. In the former, exhaustion of the trees is apparently the predisposing factor, whereas in robusta, the entrance and injury by the beetles apparently immediately influence infection by the fungus. Root disease, caused by an unidentified fungus, occurs throughout the coffee area, though it is most frequently observed in Meru; it is very destructive to individual trees and groups of trees. It has not been observed to do extensive damage, but its persistent nature requires that neighbouring dead shade trees and stumps be uprooted and burned. A "witches' broom" disease, apparently associated with a fungus at the roots, occurred on two plantations of Kent's variety; symptoms of the disease are a prolific vegetative growth in the twigs and leaves, giving a bunched and crowded appearance to the tree as a whole; many twigs and buds are abnormally swollen; and twigs have a brown core or ring; also, affected trees bear small crops of fruit, and there is a noticeable dark-green colour in the trees. A varying number of the twigs show a wither-tip. Until further observations are available, recommendations are tentative; but on affected areas diseased trees should be burned, and any further planting should be from seed from a clean area. In established plantations of Kent's variety the latter recommendation applies also; observation must be made for outbreaks, and it is advisable that the variety be planted on a small scale at first. *Phoma* spp. and *Rhabdospora* spp. have been found on twigs and berries, but were considered of little importance.

144. *Diseases of Sisal*.—Compared with other crops, sisal has few maladies; fungi found in association with pathological conditions of the sisal leaves were: *Colletotrichum agaves*, *Botryodiplodia theobromae*, *Microdiplodia agaves*, and *Helminthosporium* sp.; each of these is comparatively

restricted in its effect on the plant. The *Colletotrichum*, while everywhere abundant as a saprophyte on dead leaves, was observed parasitic only on the distal ends of otherwise healthy leaves where it had entered at the tips. A rot at the bases of the leaves of *Agave* sp. revealed, in March, bacteria in the tissues. This is a subject requiring critical study, as other leaf troubles also encountered may be associated with this organism. Leaf-scorch, which results in the epidermis and superficial tissues becoming attached to the fibres, is an ecological problem, for temperature is the only important factor known to be involved.

145. *Diseases of Cotton*.—During September, 1927, a survey was made of cotton diseases in the Morogoro and Kilosa areas, so that mature crops only have so far been studied. Leaf diseases are widely distributed, particularly in native plantations. Leaf parasites observed were: *Pseudomonas malvacearum*, *Mycosphaerella gossypina*, *Cercospora gossypina*, rust (*Kuehneola Gossypii*), *Phyllosticta* sp., areolate mildew (*Ramularia areola*), and two *Alternaria* spp.; including *A. tenuis*. Fungi in the bolls are widespread and comparatively numerous, causing loss through discolouration, destruction of fibre, and incomplete development of the bolls. Entry of the fungi into the bolls appears to depend, in some cases, on initial punctures or penetration by insects. *Eremothecium* sp. had been already recorded in the Departmental Report for 1924. Identifications were made during the year of the following fungi, collected in diseased bolls in August, 1926, at Shinyanga: *Aspergillus*, probably *A. phoenicis*, *Rhizopus nodosus* (in bolls with or without boll-worm injuries) and *Nematospora Gossypii*. On the surface of the bolls only *Diplodia gossypina* was noteworthy. *Pseudomonas malvacearum* was suspected on the bolls collected at Shinyanga in 1926, and in the Morogoro and Kilosa areas in 1927. In October, 1927, 90 per cent. of unopened second-crop bolls examined were variously affected. The importance of early uprooting and burning is thus emphasised. Seed treatment for *P. malvacearum*, if its presence is confirmed, may be found advisable. The following fungi have been found in the bolls in 1927: *Monilia sitophila*, *Cladosporium herbarum* and *Aspergillus niger*.

146. *Diseases of Coconuts*.—Coconut plantations in the Dar es Salaam coastal belt were examined, and it was found that the affection now recognised as wilt, in distinction from bud-rot, is prevalent. Gummosis of the nuts is comparatively abundant. Leaf blight (*Pestalozzia palmarum*) was observed to be widespread and abundant on the leaves, and *Diplodia epicocos* apparently saprophytic in the flower-sheaths. Palms affected with wilt show a gradual withering of the leaves from without inward, and the bud finally rots; such trees eventually lose their leaves and die. Associated with the disease gummosis is a heavy fall of nuts, and an exudation of gum from them.

147. *Fungi on Various Cultivated Plants*.—A list of these, collected in the Territory and identified at the Imperial Bureau of Mycology, is as follows:—

- Aloë—*Uromyces aloës* (Ckc.), P. Magn.
- Aubergine—*Alternaria* sp.
- Banana—*Gloeosporium musarum*, Cke. and Mass.
- Bulrush millet—*Puccinia Penniseti*, Zimm. *Sphacelia* sp. (Asali disease). *Cerebella sorghi-vulgaris*, Subram.
- Cabbage—*Alternaria circinans* (B. and C.), Bolle.
- Castor plant—*Ovulariopsis* sp. *Cercosporina ricinella* (Sacc. and Berl.), Speg.
- Ceara rubber—*Cercospora Henningsii*, Allesch.
- Celery—*Cercospora Apii*, Fresen.
- × Chillies—*Vermicularia capsici*, Syd. *Gloeosporium piperatum*, Ell. and Ev. *Alternaria tenuis*, Nees.
- × Cinchona—*Phomopsis* sp.

- Cowpea—*Cercospora cruenta*, Sacc.
 Dracaena (?)—*Dothiorella* sp.
 Fig (common)—*Kuehneola Fici*, Butl.
 Groundnut—*Cercospora personata* (B. and C.), Ellis.
 Hemerocallis aurantiaca—*Vermicularia liliacearum*, Westend.
 Ivy—*Phyllosticta* sp.
 Kidney bean—*Uromyces appendiculatus* (Pers.), Link. *Isariopsis griseola*, Sacc. *Colletotrichum lindemuthianum* (Sacc. and Mazn.), Bri. and Cav.
 Loquat—*Ascochyta Eryobotryae*, Vogl.
 Maize—*Puccinia maydis*, Bereng.
 Mulberry—*Septogloeum Mori* (Lév.), Bri. and Cav.
 Oleander—*Cercospora neriella*, Sacc.
 Orange—*Alternaria tenuis*, Nees. *Colletotrichum gloeosporioides* (Penz.), Sacc.
 Pawpaw—*Ovulariopsis Papayae*, Yan der Bijl.
 Peach—*Puccinia pruni-spinosae*, Dc.
 Pink—*Septoria Dianthi*, Desm.
 Potato—*Alternaria solani* (Ell. and Mart.), Jones and Grout.
 Pumpkin, etc.—*Cercospora Cucurbitae*, Ell. and Ev.
 Rose—*Sphaerotheca Humuli* (Dc.), Burr.
 Sorghum sp.—*Sorosporium reilianum* (Kuehn.), Mc. Alp. *Puccinia purpurea*, Cke. *Darluka filum* (Biv.), Cast. *Sphacelotheca cruenta* (Kuehn.), Potter. *S. Sorghi* (Link.), Clint.
 Tobacco—*Erisiphe cichoracearum*, Dc. *Cicinnobolus* sp.
 Wild strawberry—*Mycosphaerella Fragariae* (Tul.), Ovdem. (conidial stage). *Ramularia tulasnei*, Sacc.

LEGISLATION.

148. No legislation dealing with agricultural matters has been enacted during the year.

METEOROLOGICAL MATTERS.

149. The number of meteorological stations equipped and supervised by the Department at the end of 1926 was 105, of which 73 furnished regular records; and of these 37 had raingauges only. The plan for equipment of the first-order stations, described in the last Report, has been superseded by the organisation of a new meteorological scheme, suggested by the Egyptian Meteorological Department, and to be carried out with the aid of the countries bordering upon the water-system contributing to the source of the Nile.

REVENUE.

150. The details of this are given in Appendix V.

A. H. KIRBY,
 Director of Agriculture.

APPENDIX I.

DISTRIBUTION OF SEEDS. (By Provinces.)

Kinds.	Central.	Northern.	Eastern.	Tabora.	Mwanza.	Bukoba.	Lindi.	Kigoma.	Headquarters.
	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.
RICE.									
Borakupata ...	—	—	25	—	—	—	—	—	—
Faya ...	6	2	—	—	—	—	—	—	—
Marula ...	—	—	726	—	—	—	—	—	—
Ordinary ...	—	512	—	—	5,588	—	—	—	—
Ngukuna ...	—	—	6	—	—	—	—	—	—
Unyengwa ...	—	—	1,200	—	—	—	—	—	—
Var. Pa Biss ...	—	—	—	—	—	—	—	—	2
" " D.C. ...	—	—	—	—	—	—	—	—	2
MAIZE.									
Argentina ...	—	—	—	—	—	—	—	—	27
Kenya Hybrid ...	—	45	249	—	—	—	1,134	—	—
Potchefstroom Pearl ...	—	818	1,114	47	—	5	91	98	2,026
White Congo ...	277	500	1,720	102	91	5	—	—	660
PEAS.									
Cowpea ...	6	—	80	—	14	—	—	—	14
Field ...	—	—	—	—	—	—	—	246	136
Pigeon ...	45	—	97	399	14	—	—	—	—
Yellow Field ...	—	—	—	—	—	—	—	—	181
GROUNDNUTS.									
Basse ...	—	—	—	—	41	—	—	—	9
Ordinary ...	—	14	404	—	—	—	—	—	3,307
Virginia Bunch ...	—	—	—	5	45	—	—	—	91
CASSAVA ...	2,050	—	—	—	—	—	—	—	—
SMSIM ...	—	—	91	1	—	—	—	5	334
BEANS.									
Bonavist ...	—	—	299	145	—	—	—	5	27
Canadian Wonder ...	—	13	—	—	—	—	—	36	36
Gram ...	—	—	182	—	—	—	—	—	9
Hyacinth ...	—	2	—	—	—	—	—	—	—
Hopi ...	—	—	20	—	—	—	—	—	—
" Brown ...	—	—	—	2	—	—	—	—	—
" Pink ...	—	—	—	1	—	—	—	—	—
" White ...	—	—	—	2	—	—	—	—	—
Lima Abundance ...	—	—	590	157	9	—	26	23	59
Mat ...	—	—	—	1	—	—	—	—	—
Madagascar Butter ...	—	178	31	92	9	—	27	32	31
Native ...	—	45	—	—	—	—	—	—	—
Sugar ...	—	5	—	—	5	—	14	28	91
Soya (8 vars.) ...	—	—	—	—	—	—	—	—	4
Tepary ...	6	—	73	6	9	14	26	—	59
Velvet ...	—	—	50	200	—	—	—	—	—
MILLET.									
Bulrush ...	—	7	522	—	—	—	—	—	—
Dwarf White Sorghum ...	—	5	—	—	—	—	—	—	—
Dwarf Yellow Milo ...	—	—	1	—	—	—	—	—	1
Dwarf Hegari ...	—	—	1	—	—	—	—	—	1
Dodoma White ...	—	—	—	—	—	—	—	2	—
Proso ...	—	—	27	—	—	—	2	—	5
Panicum frumentaceum ...	1,088	—	1,170	—	—	—	5	—	—
Sorghum Bonganhilo ...	—	—	136	—	—	—	16	14	38
Sorghum Feterita ...	—	—	—	—	10	11	—	2	102
Sorghum—Kilinyali (native) ...	—	—	1,270	—	—	—	—	—	1
Sorghum—Sukesha (native) ...	—	—	23	—	—	—	—	—	—
Sorghum White ...	—	—	—	—	—	—	—	—	23
OATS ...	—	1	—	—	—	—	—	—	1
POTATOES ...	—	1,160	—	—	—	—	—	51	10,415
BARLEY ...	—	1	—	—	—	—	—	—	1
WHEAT.									
Florence ...	45	—	—	—	—	—	—	—	—
Kenya Governor ...	—	181	—	—	—	—	—	9	554

Kinds.	Central.	Northern.	Eastern.	Tabora.	Mwanza.	Bukoba.	Lindi.	Kigoma.	Headquarters.
	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.	Kgs.
COFFEE.									
Excelsa ...	—	—	—	—	—	—	—	—	1
Liberian ...	—	—	—	—	—	—	—	—	1
Robusta ...	—	—	—	—	5	—	—	—	31
TOBACCO.									
Bewdley Pryor ...	—	—	—	—	—	—	—	—	1
Golden Leaf ...	—	—	—	—	—	—	3	—	—
Groot Swazie ...	—	—	—	—	—	—	—	—	1
Hickory Pryor ...	—	—	—	—	—	—	—	—	1
Lizard's Tail ...	—	—	—	—	—	—	3	—	—
Soulook ...	—	—	—	—	—	—	—	—	1
Ginger ...	—	—	—	—	—	—	—	27	27
CHILLIES.									
Mombasa Red (long) ...	—	1	—	—	—	—	—	—	—
Ordinary ...	—	—	—	—	194	—	—	—	—
Sunflower ...	—	—	—	64	—	—	—	—	—
Castor seed ...	—	—	98	—	—	—	—	—	—
Pawpaw ...	—	—	1	—	—	—	—	—	—
Date Palm ...	—	—	—	1	—	—	—	—	—
" " Superior kinds	—	—	—	—	—	—	—	—	1
Tea ...	—	—	—	—	—	—	—	—	6
Indian Almond ...	—	—	—	1	—	—	—	—	—
Banana Suckers ...	—	5	—	—	—	—	—	—	—
Pineapple Suckers ...	—	—	—	22	—	—	—	—	—
Citrus (seedlings) ...	—	—	46	—	—	—	—	—	—
" (seeds) ...	—	—	3	—	—	—	5	—	—
Other Fruit (seedlings) ...	—	—	35	—	—	—	—	—	—
Other Fruit (seeds) ...	—	—	3	—	—	—	—	—	—
Teak ...	—	—	—	1	—	—	—	—	—
SALT BUSH.									
Old Man ...	—	—	—	1	—	—	—	—	3
Creeping ...	—	—	—	2	—	—	—	—	7
Upright ...	—	—	—	2	—	—	—	—	7
Buffel Grass ...	—	—	—	—	—	—	—	—	1
Fodder Plants									
(Packet seeds) ...	—	—	—	—	—	—	—	—	5
LUCERNE.									
Cape Province ...	—	—	—	—	—	—	—	—	5
Hunter River ...	—	—	—	—	—	—	—	—	5
Manila Hemp									
(seedlings) ...	—	—	—	—	—	—	—	—	5
Cassia Siamea ...	—	—	—	—	51	—	—	—	—
Hibiscus cannabinus									
Type 3 from Pusa ...	—	—	—	—	—	—	—	—	1
Robus probus ...	—	—	—	—	—	—	—	—	1
Schinus molle ...	—	—	—	—	—	—	—	—	3
Pisonia alba (seedlings) ...	—	—	—	—	—	—	—	—	5
Dalbergia Sissoo ...	—	—	—	—	—	—	—	—	1
Acacia Baileyana ...	—	—	—	—	—	—	—	—	3
Hydnocarpus anthelmintica	—	—	—	—	—	—	—	—	155
Passiflora foetida ...	—	—	—	—	—	—	—	—	1
Calopogonium mucunoides ...	—	—	—	—	—	—	—	—	16
Crotalaria striata ...	—	—	—	—	—	—	—	—	4
Sterculia diversifolia									
(seedlings) ...	—	—	—	5	—	—	—	—	1
Prosopis juliflora (seedlings)	—	—	—	5	—	—	—	—	—
Peltophorum ferrugineum ...	—	—	—	1	—	—	—	—	—
Tamarindus indica ...	—	—	—	1	—	—	—	—	—
Thevetia nerifolia									
(Lucky bean) ...	—	—	—	1	—	—	—	—	—
Flamboyante (seedlings) ...	—	—	22	—	—	—	—	—	—
Cedrela odorata (seedlings) ...	—	—	134	—	—	—	—	—	—
Phaseolus radiatus ...	—	—	—	—	—	—	2	—	—
Decorative Plants (seeds) ...	—	—	4	—	—	—	—	—	—
Ornamental Shrubs									
(seedlings) ...	—	—	29	—	—	—	—	—	—
Miscellaneous seeds	—	—	2	—	—	—	—	—	—
Totals ...	3,523	3,495	10,484	1,267	6,085	35	1,354	578	18,547

NOTE—No distribution has taken place in the Provinces not mentioned.

APPENDIX II.

YIELDS OF CROPS, 1927 IN POUNDS PER ACRE.
(Number of plots measured, in brackets).

PLACE	Seed-cotton	Maize	Groundnuts	Bambarsa Groundnuts	Unhusked Rice	Sorghum Millet	Simsim (Sesame)	Bulrush Millet	Cowpeas	Pigeon Pea	Gram	Bonavist Bean	Ilma Bean	Velvet Bean	Tepary Bean	Castor Seed	Sunflower
MOSHI		(A2,355(8) B2,057(2)															
Northern Upare	1,192 (12)																
Kilewo	—	—			4,416 (4)	—	—	—	—	—	—	—	—	—	—	—	—
RUFJI																	
Western : Mtanza	—	1,654 (10)			2,167 (11)	1,469 (10)	638 (1)	—	—	—	—	—	—	—	—	—	—
Eastern : Mohoro	—	1,001 (4)			1,282 (17)	1,210 (2)	297 (4)	—	—	—	—	—	—	—	—	—	—
Northern Hill-lands: Magongo	—	886 (1)		182 (1)	1,707 (5)	1,309 (11)	473 (4)	616 (1)	—	—	—	—	—	—	—	—	—
Eastern : Kikale	—	1,404 (2)			1,333 (3)	1,892 (8)	—	—	—	—	—	—	—	—	—	—	—
Central : Utete	—	—			1,676 (7)	1,311 (5)	484 (4)	—	364 (1)	748 (1)	352 (1)	484 (3)	—	—	—	—	—
Southern Hill-lands : Mtawi	—	—			—	—	—	—	—	—	—	—	—	—	—	—	—
TABORA PROVINCE																	
Lubaga	310 (4)	550 (5)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Salawe	320 (2)	—	—	—	—	368 (2)	—	—	—	—	—	—	—	—	—	—	—
Shinyanga	184 (4)	—	—	—	—	—	73 (4)	—	—	—	—	230 (4)	181 (2)	304 (3)	395 (2)	377 (2)	420 (2)
Ibadakuli	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MWANZA																	
Urima	113 (1)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ukerewe Island	123 (1)	—	212 (3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Uzinza	122 (1)	—	203 (3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sengerema	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LINDI																	
Chidia (Rovuma)	3,130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Jumburu	283	—	—	—	—	—	—	—	260	—	—	—	—	—	—	—	—
Libobe	52	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mkwaya	676	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nyengedi	—	—	—	—	—	—	230	—	—	—	—	—	—	—	—	—	—
Kiwawa	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Namufa	—	624	—	—	—	—	103	—	—	—	—	—	—	—	—	—	—
Lindi Township Boundary	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

A. Introduced.
B. Native.

APPENDIX II.—(continued).

Place	Seed-cotton	Maize	Groundnuts	Bambars Groundnuts	Unhusked Rice	Sorghum Millet	Simsim (Sesame)	Bulrush Millet	Cowpeas	Pigeon Pea	(Gram)	Boon	Lima Bean	Velvet Bean	Fermy Bean	Castor Seed	Sunflower
KILWA																	
Njinjo ...	396 (2)									440 (1)							
Mariwe ...	293 (3)																
Msimango ...	352 (1)																
Mariwe Kisangi ...	264 (1)																
Kilwa ...	319 (1)																
Ndarara ...	572 (4)																
Metela ...	176 (1)																
Kikotama ...	528 (4)									528 (1)							
Mbwita ...		1,900 (5)															
Mkondaji ...		1,232 (3)										1,892 (2)					
Mehakawa ...																	
Majongo ...																	
Tifo ...																	
Kandaware ...																	
Namatewa ...																	
Ngambi ...																	
Nambanje ...																	
SINGIDA																	
Wanyiramba ...		554 (5)	678 (10)									1,307 (10)					
Wagogo ...		327 (5)	414 (15)	552 (6)								453 (10)					
Wamyaturu ...		557 (2)	323 (5)									323 (25)					

APPENDIX III (A).

TANGANYIKA TERRITORY—RAINFALL IN MILLIMETRES, 1927.

Province	District	Meteorological Station	Altitude Feet	Latitude S.	Longitude E.	January	February	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	Year's Total
Eastern ...	Dar es Salaam	...	30	6°50'	39°17'	46.0	73.4	280.1	132.8	100.9	1.6	12.7	15.4	19.7	134.4	188.4	193.1	1,198.5
	Mafia Island	...	63	7 55	39 45	139.0	Nil	555.3	619.0	81.0	60.0	Nil	20.0	Nil	43.0	147.0	318.0	1,982.3
	Msimbazi Mission	...	—	6 50	39 17	33.0	51.0	233.8	113.7	64.3	Nil	4.2	Nil	38.0	184.3	159.0	208.0	1,051.3
	Ruvu	...	—	6 48	39 45	114.0	29.5	179.0	263.0	28.0	—	5.0	15.5	38.0	155.0	62.0	231.5	1,130.5
	Soga	...	508	—	—	3.8	1.8	12.5	10.4	0.8	—	Nil	0.3	0.2	5.3	4.3	6.8	46.2
	Morogoro	...	1,628	6 48	37 46	133.3	3.8	186.3	190.6	43.6	28.1	2.1	5.1	8.4	41.5	34.1	150.2	827.1
	Ngerengere	...	641	6 47	38 08	58.5	68.4	234.0	447.1	60.4	5.1	2.0	17.8	11.8	150.8	97.8	214.7	1,368.4
	Kilosa	...	1,606	6 48	37 01	133.6	47.0	206.6	272.3	67.0	Nil	Nil	Nil	4.0	43.3	101.7	120.7	966.2
	Mpanganya	...	105	8 00	38 45	153.2	49.7	317.8	296.7	21.9	—	3.0	—	11.0	24.1	93.2	150.1	1,120.7
	Utete	...	327	8 00	38 45	119.0	52.5	231.0	142.5	31.1	—	1.5	—	3.7	7.8	115.1	39.2	743.4
Central ...	Dodoma	...	3,693	6 11	35 46	165.5	55.9	149.1	34.8	Nil	—	Nil	—	Nil	Nil	Nil	126.6	531.9
	Bugiri Mission	...	—	—	—	5.8	2.9	115.9	0.8	—	—	—	—	—	0.4	—	2.4	128.2
	Mpwapwa	...	—	—	—	201.8	132.8	162.0	202.4	18.5	—	—	—	—	0.2	—	—	207.8
	Kondoa	...	4,610	4 57	35 38	167.9	45.2	187.5	33.6	14.4	—	—	—	—	3.0	Nil	80.9	941.7
	Manyoni	...	4,135	5 39	34 07	140.8	114.7	201.7	121.0	7.0	—	—	—	—	9.2	5.3	172.9	532.5
	Singida	...	5,233	4 48	34 45	92.6	78.2	118.3	56.8	Nil	—	—	—	—	Nil	Nil	159.3	772.6
	Mkalama	...	4,235	4 06	34 38	47.1	33.2	260.7	50.2	20.1	—	—	3.0	9.0	3.0	34.2	94.2	505.2
	Mvumi Mission	...	3,300	5 00	35 00	167.6	49.3	104.4	66.3	Nil	—	—	Nil	Nil	Nil	Nil	126.5	514.1
	Tabora	...	4,000	5 00	32 00	113.5	103.1	270.1	96.7	3.2	3.4	—	—	6.4	7.0	23.0	191.0	817.4
	Kahama	...	4,055	3 35	32 33	208.5	37.3	233.3	156.8	40.2	2.1	—	—	Nil	Nil	22.6	148.0	848.8
Tabora ...	Ushirombo	...	—	—	—	143.4	119.1	240.2	168.2	47.8	Nil	—	—	5.5	14.0	97.9	129.1	965.2
	Nzega	...	—	4 15	33 08	150.2	64.6	103.6	104.9	33.8	—	—	13.2	1.0	6.4	16.6	124.8	619.1
	Ndala	...	—	—	—	71.4	40.7	33.1	95.7	Nil	—	—	Nil	Nil	Nil	24.0	117.5	382.4
	Kola Ndota Mission	...	4,400	3 34	33 19	71.1	33.4	94.7	162.2	35.1	—	—	2.1	—	5.5	23.1	113.8	541.0
	Luhombo Mission	...	4,400	3 60	33 03	111.6	15.4	185.8	242.5	67.0	—	—	Nil	2.0	2.1	52.3	93.8	872.5
	Kigoma	...	2,531	4 52	29 38	236.5	211.1	210.4	115.9	44.8	—	—	—	Nil	8.6	57.2	121.2	1,005.7
	Ujiji	...	2,738	4 59	29 47	204.3	176.9	244.8	138.0	44.1	—	—	—	—	20.6	52.2	319.5	1,200.4
	Kasulu	...	4,530	4 35	30 07	179.5	229.3	176.5	272.4	64.2	—	—	—	7.2	26.9	50.1	135.2	1,141.3
	Kibondo	...	4,931	3 34	30 42	116.0	57.0	330.0	237.0	278.0	10.0	—	9.0	9.0	33.8	67.0	142.5	1,289.3
	Namanyere	...	5,100	8 00	32 00	82.1	64.0	118.6	101.3	40.8	Nil	—	Nil	2.0	Nil	33.0	176.0	617.8
Kigoma ...	Kate Mission	...	—	—	—	183.1	144.1	209.5	139.9	56.9	16.8	—	—	Nil	—	68.6	372.9	1,181.8
	Kala Mission	...	—	—	—	736.0	322.0	705.0	272.0	276.0	Nil	—	—	—	—	110.0	312.4	2,733.4
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

APPENDIX III (A) (continued).
TANGANYIKA TERRITORY.—RAINFALL IN MILLIMETRES, 1927.

Province	District	METEOROLOGICAL STATION	Altitude Feet	Latitude S	Longitude E	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR'S TOTAL
Lindi	Lindi	Lindi	S.L.	10°00'	39°49'	254.2	94.0	119.4	275.4	5.2	Nil	5.7	Nil	Nil	3.0	48.1	253.4	1,058.4
	"	Masasi Mission	1,505	10 42	38 53	138.2	56.1	225.7	161.0	4.9	"	0.6	"	"	1.8	24.7	105.6	718.6
	"	Tunduru	2,300	11 05	37 27	196.0	149.5	130.0	93.0	Nil	"	Nil	"	"	3.0	79.0	74.0	724.5
	"	Ndanda Mission	"	"	"	257.0	57.3	110.5	175.4	12.7	"	5.0	0.3	"	2.0	39.1	241.1	900.4
	Mkindani	Mkindani	"	10 16	40 07	18.5	8.6	6.6	10.5	53.3	"	33.0	10.0	"	14.2	116.4	206.8	472.9
Tanga	Kilwa	Kilwa	1,700	8 50	39 00	86.5	82.3	150.2	295.5	25.1	"	Nil	23.1	5.6	14.0	135.3	282.0	1,100.6
	"	Kilwa	S.L.	4 44	39 25	259.0	32.8	98.4	111.7	Nil	"	19.5	1.2	13.5	5.2	92.8	138.9	703.0
	"	Liwale	1,500	9 45	38 00	348.7	113.2	103.0	116.5	"	"	Nil	Nil	Nil	7.1	52.5	193.0	934.0
	"	Kikanda	S.L.	8 30	39 15	95.4	35.1	56.8	184.8	7.1	"	1.2	12.6	9.7	11.2	99.8	232.5	759.0
	Pangani	Pangani	S.L.	5 25	38 58	1.6	2.8	203.0	134.7	201.6	25.1	29.7	46.4	85.0	349.8	100.4	280.8	1,463.9
Northern	"	Lulago Estate	"	5 06	38 38	76.6	38.6	261.5	184.2	201.2	69.8	38.7	76.4	79.9	344.5	71.2	270.1	1,712.7
	Usambara	Amani	3,004	"	"	46.2	31.0	247.8	296.7	320.9	76.2	67.0	92.9	133.6	624.5	224.8	324.5	2,486.1
	"	Kwashemushi	"	"	"	37.1	7.0	171.1	193.2	205.0	81.9	40.9	35.8	51.2	363.0	115.0	139.2	1,456.4
	"	Lushoto	4,579	4 47	38 17	181.7	50.0	254.8	120.1	265.4	106.2	122.0	7.9	9.9	72.4	21.1	98.8	1,310.4
	"	Sakare N'Garia	"	"	"	61.4	24.1	211.8	204.7	326.6	2.1	52.3	48.5	71.1	314.7	94.0	181.1	1,592.7
Mwanza	"	Ambangulu	"	"	"	52.9	82.6	197.0	157.1	460.6	76.0	77.6	73.3	126.4	835.1	77.3	45.7	1,761.6
	Arusha	Arusha	4,416	3 23	36 43	64.6	26.0	346.0	272.0	141.1	18.0	10.0	11.3	13.1	48.0	19.2	126.0	1,095.3
	Moshi	Kilima Mission	4,703	3 19	37 29	43.3	17.0	507.7	312.2	206.3	36.4	30.6	72.4	25.1	137.3	67.5	288.9	1,744.7
	"	Moshi	2,649	3 22	37 22	7.5	Nil	227.5	83.5	143.0	31.0	2.0	17.3	1.0	49.0	12.8	50.5	625.1
	Mbulu	Mweka Estate	3,850	3 17	37 19	21.0	5.0	248.5	177.0	330.5	71.5	46.0	50.0	4.0	53.0	16.5	139.7	1,162.7
Bukoba	"	Mbulu	5,900	3 52	35 37	105.1	15.9	395.0	100.0	28.1	1.5	Nil	1.0	Nil	27.1	7.0	155.6	836.3
	Mwanza	Mwanza	3,709	3 32	32 53	115.9	22.2	134.2	142.4	108.2	17.5	"	Nil	3.8	5.7	95.7	196.3	841.9
	"	Kome Island	3,800	2 25	32 28	68.0	109.0	194.2	225.0	52.0	Nil	"	8.0	20.0	18.0	69.1	144.2	908.5
	"	Murunguru Mission	"	"	"	67.8	130.5	300.2	300.7	127.8	17.2	"	1.8	0.2	0.2	4.9	133.1	1,084.4
	"	Sumvi Island	4,000	2 45	33 15	32.6	38.0	187.1	94.4	23.6	Nil	"	3.8	5.8	17.8	24.1	49.5	517.2
Mahenge	"	Kijima Mission	3,750	3 50	33 70	154.1	75.2	205.5	94.4	23.6	"	"	29.5	31.0	3.4	4.0	108.6	729.3
	"	Musoma	3,709	- 1 28	33 47	52.5	108.1	228.9	186.2	92.0	2.0	"	6.0	1.3	17.2	15.3	55.4	774.9
	Bukoba	Bukoba	3,709	1 20	31 47	136.1	114.4	317.7	316.6	239.7	37.3	"	64.7	90.7	121.1	157.6	226.8	1,842.7
	"	Kagondo	4,252	1 18	31 15	59.6	64.5	339.2	280.9	179.9	5.4	Nil	10.2	109.8	91.2	79.9	139.1	1,439.1
	Biharamulo	Biharamulo	4,350	2 42	31 26	89.7	111.2	205.7	146.0	86.1	50.8	Nil	10.2	48.3	76.2	83.8	151.6	1,038.6
Iringa	"	Itakara Mission	"	"	"	267.2	76.7	185.7	195.9	82.8	2.4	4.8	4.4	2.1	3.7	52.5	153.3	1,031.5
	Songea	Songea	3,826	10 42	35 40	474.1	221.2	171.5	146.2	Nil	Nil	Nil	Nil	Nil	Nil	3.2	214.0	1,230.2
	"	Milo	8,300	10 04	34 39	324.5	189.5	254.1	402.0	90.9	1.4	12.8	0.3	"	"	23.4	396.6	1,695.5
	"	Iringa	5,365	7 43	35 37	174.4	126.3	271.1	147.4	9.1	"	"	"	"	"	1.8	192.8	922.9
	Mbeya	Igali	1,958	"	"	438.4	122.5	195.5	66.0	5.1	Nil	Nil	Nil	"	"	21.1	227.8	1,071.3
Njombe	"	Madibira	"	8 64	19 96	195.8	86.4	199.6	67.3	"	"	"	"	"	18.5	23.6	188.5	784.8
	"	Ngurube	"	"	"	134.0	69.5	130.0	137.0	3.0	"	"	"	"	Nil	2.0	267.5	822.5
	"	Njombe	"	"	"	194.8	172.0	144.7	141.8	7.2	"	"	"	"	4.0	1.0	185.4	834.0
	Rungwe	Tukuyu	5,069	9 15	33 38	337.3	193.5	239.8	338.5	252.1	153.7	123.3	35.5	"	2.3	49.8	319.8	2,102.9
	"	Musekera Estate	3,800	9 15	33 38	352.5	157.1	302.1	546.2	222.3	150.9	73.8	8.9	1.2	21.5	43.2	258.4	2,138.1

Month	Mean Pressure	AIR TEMPERATURE (° CENTIGRADE)						WET BULB			TENSION OF VAPOUR	
		Dry Bulb		Mean		Means of		Absolute Max. and Min.				
		9 h | 14 h		½ (Max + Min)		Max. | Min.		Date			9 h | 14 h	
								Max.	Date	Min.	14 h	Mean
January	...	29.4	30.8	28.9	32.4	25.5	35.0	29, 30	7, 8, 12, 13	22.5	25.7	26.0
February	...	29.9	30.9	29.2	32.5	26.0	34.5	7, 14	16	21.5	25.9	26.5
March	...	27.4	29.0	28.6	30.7	26.5	33.5	12	10, 17	21.5	25.2	26.0
April	...	27.1	28.5	26.9	30.9	22.9	33.0	25, 26	29	21.0	25.2	24.7
May	...	25.7	28.0	25.6	29.5	21.8	32.5	1	20, 31	20.5	23.9	24.2
June...	...	24.1	28.1	24.4	29.0	19.8	30.5	15	19, 26, 29	18.0	21.5	22.4
July	22.9	26.4	23.7	28.3	19.1	30.0	23, 4, 5, 6, 8, 29	7, 9, 15, 21, 24, 26, 27	18.0	21.0	20.4
August	...	24.0	27.4	24.2	28.8	19.6	31.0	20, 23	7	17.5	21.1	22.8
September	...	25.5	27.3	24.3	28.8	19.9	31.5	19	3, 8	18.0	23.0	24.0
October	...	26.9	28.2	25.5	29.5	21.5	32.0	21	5	19.0	24.5	25.2
November	...	27.8	28.7	26.1	29.8	22.5	31.0	15, 23, 24, 25	14	20.5	25.5	26.4
December	...	28.3	28.9	27.3	30.4	24.2	32.0	18, 21, 25	20, 21, 22	22.5	26.2	26.8

Month	Amount of Cloud		Rainfall in millimetres (Day with rain = 0.2 mm.)		Weather Number of days of						Wind Number of Observations of										
	9 h	14 h	Total for month	In any one day		Rain	Snow	Hail	Thunder Storms	Clear sky	Over- cast	Gales	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
				Max.	Date																
January	46.0	19.4	6	4															
February	73.4	56.4	15	4															
March	280.1	70.8	21	14															
April	132.8	30.0	12	11															
May	100.9	21.2	23	12															
June...	1.6	1.6	17	1															
July	12.7	5.1	9	7															
August	15.4	7.2	27	5															
September	19.7	10.9	22	5															
October	134.4	87.4	27	7															
November	188.4	105.4	27	7															
December	193.1	83.2	8	14															

Month	Mean Pressure	AIR TEMPERATURE (° CENTIGRADE)										WET BULB			TENSION OF VAPOUR		
		Dry Bulb		Mean	Means of		Absolute Min. and Max.										
					9 h	14 h	$\frac{1}{2}$ (Max + Min)	Max.	Min.	Max.	Date	Min.	Date	9 h	14 h	Mean	9 h	14 h	Mean
		January	...	21.0	26.7	21.5	28.9	14.2	32.0	2, 31	11.0	26	18.5	24.0			
February	...	21.7	29.4	22.2	31.3	13.2	35.0	7	11.0	26	19.0	25.6					
March	...	19.8	24.5	21.1	26.3	15.9	31.0	1	15.0	1, 2, 3, 7, 19, 20, 28	18.7	22.2					
April	...	20.2	24.6	20.8	25.6	16.0	28.0	8, 9, 10	15.0	27, 28, 29, 30	18.6	22.4					
May	18.8	22.2	19.3	23.9	14.7	25.0	1, 5, 6, 7, 12, 13, 14 15, 16, 17, 18, 19, 20 21	13.0	5, 29, 30	17.5	19.7					
June...	...	15.6	20.5	17.1	21.9	12.3	24.0	14, 15, 16	11.0	27	14.5	17.9					
July	15.1	19.6	16.3	20.7	12.0	22.0	5, 8, 11, 15, 16, 17 18, 27, 28, 29, 30, 31	10.0	1	14.0	17.0					
August	...	14.5	19.5	17.1	21.5	12.8	24.0	15, 26, 27, 28	12.0	1, 2, 4, 5, 25	14.2	18.1					
September	...	15.8	21.4	17.8	22.3	13.3	24.0	8, 23, 30	12.0	7, 9	14.8	20.1					
October	...	17.6	24.1	19.7	24.9	14.6	26.0	27	13.0	2, 3	16.8	21.7					
November	...	20.0	25.0	20.2	26.0	14.5	28.0	30	11.0	28	17.9	21.3					
December	...	19.7	25.0	20.6	25.9	15.4	27.0	6, 19, 21, 22, 23, 24	14.0	17, 24, 28, 29	17.8	20.1					

Month	Amount of Cloud		Rainfall in millimetres (Day with rain = 0.2 mm.)		Weather Number of Days of					Wind Number of Observations of					Caltr.						
	9 h	14 h	Total for month	In any one day		Rain	Snow	Hail	Thunder Storms	Clear sky	Over- cast	Gales	N.	N.E.		E.	S.E.	S.	S.W.	W.	N.W.
January	64.6	22.0	6	10															
February	26.0	15.0	15	3															
March	346.0	80.0	16	20															
April	272.0	77.0	20	14															
May	141.1	50.0	29	23															
June...	18.0	3.0	2	10															
July	10.0	2.0	19, 20, 21	7															
August	11.3	4.0	16	9															
September	13.1	7.0	5	3															
October	48.0	26.0	27	9															
November	19.2	12.5	2	4															
December	126.0.	30.0	11	17															

Month	Mean Pressure	AIR TEMPERATURE (° CENTIGRADE)							Absolute Max. and Min.			RELATIVE HUMIDITY			TENSION OF VAPOUR		
		Dry Bulb		Mean	Means of		Max.	Date									
		9 h	14 h	(½ Max + Min)	Max.	Min.	Max.	Date	Min.	Date	9 h	14 h	Mean				
January	25.0	28.2	21.8	30.0	20, 21, 23, 24, 25, 26, 27	18.0	5								
February	24.8	29.2	20.4	31.0	8, 9	17.0	27, 28								
March	24.0	28.2	19.9	32.0	13, 14	17.0	26								
April	24.5	28.9	20.2	31.0	3, 4, 5	19.0	2, 7, 18, 19, 28, 29								
May...	26.0	30.0	22.0	31.0	1, 5, 6, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31	21.0	12, 13, 14, 15, 16, 21, 22, 23, 24, 25, 26								
June...	23.6	29.3	17.9	31.0	1	15.0	29								
July	23.0	29.4	16.7	30.0	1, 5, 6, 7, 8, 9, 10, 11, 12, 17, 18, 21, 22, 24, 25, 26, 27, 28, 29	14.0	14								
August	24.5	30.2	18.8	32.0	27, 28, 29	17.0	15, 16, 18, 19, 20								
September	25.3	31.0	19.6	35.0	12	18.0	10, 11, 12, 13, 25								
October	26.5	32.5	20.6	35.0	14, 15, 24, 26, 27, 28	20.0	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 23, 24								
November	24.9	29.8	20.0	33.0	6, 7, 8	19.0	16, 17, 26, 27								
December	25.0	28.7	21.4	33.0	31	19.0	12, 13								

Month	Amount of Cloud	Rainfall in millimetres (Day with ran = 0.2 mm.)			Weather					Wind										
		Total for month	In any one day		Rain	Snow	Hail	Thunder Storms	Clear sky	Over- cast	Gales	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
			Max.	Date																
January	...	263.5	66.0	3	8															
February	...	211.1	73.0	26	5															
March	...	210.4	89.3	29	14															
April	...	115.9	35.0	18	9															
May	44.8	21.0	9	5															
June...	...	None	None	None	None															
July	"	"	"	"															
August	...	"	"	"	"															
September	...	"	"	"	"															
October	...	8.6	8.6	17	1															
November	...	57.2	16.0	24	6															
December	...	121.2	52.5	20	6															

APPENDIX III (C).

TANGANYIKA TERRITORY.—AVAILABLE RAINFALL AVERAGES (IN MILLIMETRES) TO END OF 1927.

Province	METEOROLOGICAL STATION	Altitude Feet	Latitude S.	Longitude E.	Number of years German Records	Total Number of years of Records	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Highest Annual Rainfall	Lowest Annual Rainfall
Northern ...	Arusha ...	4,416	3°23'	36°43'	—	6	53.2	103.0	169.9	330.5	152.6	33.5	11.3	14.6	17.7	33.9	135.5	83.7	1,139.4	1,222.5	959.7
	Mbulu ...	5,900	3 52	35 37	3	9	98.5	90.3	159.0	155.4	59.5	2.5	1.1	2.0	5.4	15.9	63.5	105.6	789.7	1,217.0	594.0
	Moshi ...	2,649	3 22	37 22	12	19	34.1	52.8	109.2	362.1	246.0	43.8	36.8	21.2	16.8	26.2	73.8	47.0	1,059.8	1,031.4	470.0
	Tanga ...	S.L.	5 40	39 07	18	25	40.7	49.0	108.1	298.1	322.1	67.9	97.0	79.5	82.6	116.1	183.4	63.4	1,508.4	2,237.1	1,113.8
Tanga ...	Amani ...	3,004	5 06	38 38	10	17	91.5	74.1	149.2	388.9	351.7	110.6	110.5	95.4	102.3	184.6	205.3	165.2	2,029.3	2,486.1	1,560.2
	Lushoto ...	4,579	4 47	38 17	10	17	75.2	83.3	120.6	231.3	214.0	49.0	46.2	15.4	12.8	32.7	100.1	116.6	1,097.7	1,451.4	968.6
	Sakare ...	4,500	5 00	38 25	8	13	84.0	81.4	101.7	355.7	541.3	120.6	133.8	72.4	59.6	109.7	99.6	85.3	1,844.6	1,893.6	1,584.1
	Pangani ...	S.L.	5 25	38 58	12	18	47.2	28.2	100.8	171.4	217.0	47.2	65.9	43.0	37.3	79.5	121.8	76.2	1,085.3	1,576.8	79.8
Eastern ...	Dar es Salaam ...	30	6 50	39 17	19	25	76.0	54.8	125.9	277.7	178.6	30.2	38.5	25.6	29.8	39.1	75.3	97.5	1,049.0	1,297.9	591.8
	Bagamoyo ...	S.L.	6 25	38 55	14	20	87.7	47.7	106.1	238.9	170.4	30.7	33.5	29.3	28.3	41.4	91.4	112.1	1,017.5	1,260.5	748.1
	Kilindoni (Mafia) ...	63	7 55	39 45	—	6	155.0	92.3	266.4	309.0	156.2	42.5	18.3	17.3	29.0	40.8	105.3	199.9	1,432.1	1,582.3	1,159.5
	Utete ...	327	8 00	38 45	—	6	90.3	79.9	156.2	124.3	50.1	13.3	2.1	Nil	11.9	22.6	97.3	41.2	689.2	779.3	590.8
Lindi ...	Mpanganya ...	105	8 05	38 40	5	8	132.9	70.8	170.9	248.9	56.6	0.7	3.1	5.9	12.4	24.8	65.4	69.6	861.9	1,120.7	747.5
	Morogoro ...	1,628	6 48	37 46	7	12	105.8	93.7	194.1	228.4	81.6	36.3	21.2	8.6	23.9	23.9	40.2	125.9	983.6	857.4	643.8
	Kilosa ...	1,606	6 48	37 01	12	17	128.1	133.4	135.7	169.7	63.9	11.3	13.9	15.8	16.5	24.3	62.6	95.9	871.1	1,045.8	781.4
	Ngerengere ...	641	6 47	38 08	—	6	65.8	103.8	125.6	187.9	106.7	23.6	7.3	18.7	50.2	53.8	83.8	83.7	910.9	1,370.4	737.2
Central ...	Lindi ...	S.L.	10 00	39 43	13	19	148.7	111.6	143.1	154.5	390.2	4.3	3.4	3.3	4.3	17.7	58.5	138.2	1,177.8	1,058.4	427.8
	Tunduru ...	2,300	11 05	37 27	—	6	223.9	192.6	159.5	71.6	14.8	1.3	1.2	30.0	0.7	5.3	31.0	108.6	840.4	1,227.6	549.1
	Masasi Mission ...	1,505	10 42	38 53	4	10	157.0	141.7	134.2	74.5	18.2	2.5	2.6	2.8	6.3	8.3	33.3	120.0	701.5	1,221.6	546.3
	Mikindani ...	40	10 16	40 07	10	14	119.1	95.9	116.7	146.9	42.7	7.3	11.1	7.3	12.2	12.4	41.5	173.4	786.5	1,148.0	68.0
Tabora ...	Kilwa ...	S.L.	8 44	39 25	14	20	130.3	106.3	152.0	206.1	60.2	9.0	9.2	11.4	14.5	16.2	49.3	114.9	879.5	1,036.0	470.2
	Liwale ...	1,500	9 45	38 00	—	6	186.7	233.6	115.6	96.2	30.9	0.2	0.5	3.6	4.6	15.4	46.3	142.1	875.7	1,229.8	502.7
	Dodoma ...	3,693	6 11	35 46	—	6	142.0	104.1	64.1	58.7	1.3	Nil	Nil	Nil	Nil	1.6	14.0	113.8	499.6	722.5	220.8
	Manyoni ...	3,135	5 39	34 07	—	5	164.5	102.4	127.3	111.5	5.0	0.5	—	—	0.8	6.7	59.9	126.4	705.0	875.9	332.6
Kigoma ...	Singida ...	5,233	4 48	34 45	3	8	118.8	99.4	115.7	46.7	3.5	0.6	—	0.2	Nil	4.9	35.4	120.9	564.1	749.6	495.0
	Kondoa Irangi ...	4,610	4 57	35 35	9	14	107.9	91.0	101.6	72.2	11.8	0.7	—	0.1	1.1	5.6	31.4	102.3	604.9	621.1	281.1
	Mkalama ...	4,235	4 06	34 38	4	10	93.6	91.1	137.1	98.3	29.5	0.4	1.7	1.6	3.1	13.8	77.3	119.4	666.4	1,101.9	520.0
	Kahama ...	4,055	3 35	32 33	—	6	131.7	131.9	196.3	145.3	37.0	5.0	2.8	0.6	7.8	36.9	109.7	142.2	947.2	1,170.9	739.3
Iringa ...	Tabora ...	4,000	5 00	32 00	14	19	129.8	122.1	161.6	132.8	15.1	2.6	Nil	0.5	7.8	14.6	107.2	135.8	829.9	1,303.4	546.0
	Kola Ntola Mission ...	4,400	3 34	33 19	—	5	91.9	79.0	127.7	130.3	40.3	3.5	1.2	0.4	12.8	18.3	97.6	122.3	725.3	892.7	541.0
	Kigoma ...	2,531	4 52	29 38	—	6	119.6	120.6	109.3	101.9	48.3	15.5	3.2	2.7	20.7	33.0	131.4	163.2	869.4	1,165.4	482.8
	Ujiji ...	2,738	4 59	29 47	9	15	110.2	131.6	147.6	147.7	48.7	6.4	7.4	3.1	11.4	40.1	114.2	143.7	912.1	1,200.3	665.6
Mahenge ...	Kasulu ...	4,530	4 35	30 07	—	6	177.1	180.2	172.1	201.2	60.3	5.8	Nil	6.6	24.0	75.2	112.6	167.3	1,182.8	1,329.1	1,092.8
	Namanyere ...	5,100	8 00	32 00	—	6	129.2	112.5	17.5	82.1	64.1	5.2	1.7	3.9	14.9	16.1	71.4	135.8	751.4	988.3	474.6
	Iringa ...	5,365	7 47	35 37	5	10	150.2	107.2	165.3	84.7	6.4	0.8	0.1	Nil	0.9	3.6	41.0	110.6	670.8	922.9	524.7
	Tukuyu ...	5,069	9 15	33 38	9	16	256.7	213.6	329.4	531.6	311.5	73.6	66.9	53.6	47.9	58.2	105.6	199.9	2,248.5	2,650.9	2,102.9
Mwanza ...	Mahenge ...	3,352	8 40	36 43	9	16	335.9	260.1	326.4	302.4	96.8	34.8	16.1	*15.6	12.7	*39.9	*69.4	*234.2	1,744.3	2,106.2	1,369.9
	Songea ...	3,826	10 42	35 40	10	16	255.5	235.7	277.9	119.8	14.5	1.9	0.8	0.4	2.4	9.4	40.2	175.4	1,133.8	1,328.9	667.7
	Mwanza ...	3,709	3 32	32 53	11	17	76.5	91.4	139.9	230.5	75.3	24.6	5.6	24.0	38.9	65.8	125.8	121.5	1,019.8	1,298.2	841.9
	Musoma ...	3,709	1 28	33 47	—	5	60.9	105.5	107.1	148.2	113.6	13.8	14.0	23.9	13.1	39.7	113.7	62.0	815.5	1,011.8	641.3
Bukoba ...	Bukoba ...	3,709	1 20	31 47	11	18	121.4	135.3	235.8	368.6	298.1	65.1	43.1	86.9	94.8	109.8	206.6	168.6	1,934.1	2,136.6	1,553.4
	Biharamulo ...	4,350	2 42	31 26	—	6	114.5	112.1	154.2	174.0	80.8	26.1	4.7	23.8	38.3	40.6	70.1	129.0	880.6	1,096.6	582.0

NOTE :—Highest and lowest annual rainfall figures from British Records only, as annual figures are not available from earlier records.

*Indicates averages up to 1926.

APPENDIX IV.

LIST OF GINNERIES EXISTING IN 1927-28.

No.	District	Locality	Number of Gins		Licensee
			Saw	Roller	
1	Dar es Salaam	Pugu	1	13	Abdulrasul & Sons
2	"	Dar es Salaam	1	16	Rosehaugh & Co.
1	Morogoro	Morogoro	—	28	Rosehaugh & Co.
2	"	Mikese	3	19	Japan Cotton Trading Co.
3	"	Ngerengere	1	7	Rosehaugh & Co.
4	"	Mlali	—	18	Tanganyika Cotton Co.
5	"	Duthumi	—	8	Tanganyika Cotton Co.
1	Kilosa	Kilosa	—	14	Rosehaugh & Co.
2	"	Rudewa	—	20	Tanganyika Cotton Co.
3	"	Mkata	—	12	Karimjee Jivanjee & Co.
4	"	Msowero	—	6	Kladites and Samaris.
5	"	Turiani	—	6	Tanganyika Cotton Co.
1	Rufiji	Kilimani	—	12	Frantzis & Horn
2	"	Lugeloge†	—	12	Frantzis & Horn
3	"	Betya†	—	16	Rosehaugh & Co.
1	Bagamoyo	Bagamoyo	1	8	Holy Ghost Mission
1	Lindi	Lindi†	—	14	Mathuradas Kalidas
2	"	Lindi†	—	14	Rosehaugh & Co.
1	Kilwa	Kikanda†	1	7	Rosehaugh & Co.
1	Tanga	Tongoni†	1	10	G. Galanos
1	Usambara	Kwashemshi†	2	—	Kwashemshi Estates
1	Handeni	Mamundu	1	—	Kwashemshi Estates
1	Moshi	Moshi	—	6	N. M. Dadani
2	"	Himo	1	12	Shariff Jiwa & Co.
3	"	Himo*†	—	2	A. Mongardi
4	"	Himo*†	1	1	F. Deusebis
1	Mbulu	Idulu†	—	5	M. Michaelakis
1	Shinyanga	Usogore	4	—	B.E.A. Corporation
2	"	Luhomo	4	—	B.E.A. Corporation
1	Mwanza	Mwanza	—	14	Nakasero Trading Co.
2	"	Murutunguru	1	10	White Fathers' Mission
3	"	(Ukerewe Island)	—	—	—
4	"	Ihale	—	11	G. H. Abdulrasul & Co.
5	"	Nyambiti	2	6	B.C.G. Association
6	"	Nyanguge	2	5	B.C.G. Association
7	"	Pambani	—	10	Kampala General Agency
8	"	Runere	5	—	B.E.A. Corporation
9	"	Malampaka	5	—	B.E.A. Corporation
10	"	Bukumbi	—	12	Bhagwanji Sundergi & Co.
	"	Nassa	—	12	Narandas Rajaram & Co.

*Private Ginneries.

†Not licensed in 1927-28.

APPENDIX V.

REVENUE, FINANCIAL YEARS 1926-27, 1927-28.

	1927-28		1926-27.	
	Shs.	Total, Shs.	Shs.	Total, Shs.
Receipts from Government Plantations :—				
Bagamoyo	16,315·00		15,211·03	
Dar es Salaam (including Mafia)...	18,869·56		25,398·02	
Dodoma	Nil		50·00	
Kasanga	79·00		146·00	
Kigoma	940·18		733·05	
Kilwa	60·80		210·00	
Kilosa	546·70		392·00	
Lindi	375·00		150·00	
Lushoto	51·25		205·00	
Mahenge	191·00		102·00	
Miombo Government Farm ...	1,000·00		1,000·00	
Mikindani	320·00		181·00	
Morogoro	703·50		952·80	
Mwanza	132·55		564·68	
Pangani	1,445·16		1,545·12	
Tabora	533·70		748·95	
Tanga	13,993·00		25,217·00	
Utete	692·00		639·50	
		56,248·40		73,446·15
Miscellaneous Sales of Produce and Planting Material :—				
Morogoro Agricultural Station ...	1,732·36		3,630·20	
Mpanganya Agricultural Station...	791·30		1,333·46	
Botanic Gardens, Dar es Salaam	53·03		59·50	
Headquarters Office, „	5·97		245·00	
		2,582·66		5,268·16
Total		58,831·06		78,714·31

